The Chemical Age

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The Trend of Progress

THE selection of papers and procedure for an annual meeting is always a problem of some difficulty. Some societies regard the function primarily as an opportunity of social intercourse, reducing papers to a minimum. Others, however, provide a menu of papers so indigestible that the Presidents themselves have, on occasion, been moved to cry out for quarter. The Society of Chemical Industry this year has a nicely balanced selection, and there can be few present at the meeting who would quarrel with the fare provided. It is true that there seemed to be no particular plan in selecting the industries to be discussed, but there is much to be said for a general discussion on the " Trend of Progress " in chemical industries. Progress, it has been said, is not an accident, but a necessity; it is part of nature. Thus it is that in serving the world as we know it with its constantly varying changes of fashion and taste and beliefs, the chemical industry makes a common progress, with other industries, like vessels on the same tide. Though there may not have been any obvious plan in the selection of the papers, the industries represented are all associated with the daily wants of mankind. The provision of raw materials for industry is a problem of considerable magnitude. Mr. P. W. Tainsh notes that although it was not many years ago since tallow was the only fat available to soap-makers, its place is now shared by hardened whale oil and by palm oil. He states that whereas in 1919-1920 the world catch of whales was 11,369, in 1937-1938 the catch was 46,039 whales, and unless the industry could be subjected to rigid control and regulation, the end might not be so very far off. The difficulty is in getting international agreement for control, and undoubtedly the fault does not lie only with this country, but to an even greater extent with some foreign whaling countries. The greatest contribution which chemists can make to the problem of the preservation of whales is to find alternative sources of oils, and even to tackle the problem of the synthesis of oils. Obviously, from the information given in this paper, much could be done by improving the cultivation of palms and the production of palm oil. It is already evident that there are possibilities—to put it no higher—of making fatty acids from hydrocarbon oils either derived from petroleum or from certain fractions obtained from the Fischer-Tropsch synthesis, and a large-scale plant should be operating this year in Germany. Another curious fact is that in spite of the obvious economies to be derived from continuous working, and the attractions of continuous soap production processes to inventors, no one has yet succeeded in producing a practical process.

The lot of the cosmetic chemist does not seem to be a happy one, if we may judge from Mr. Redgrove's paper. He appears to combine the functions of chemist, dermatologist and beauty specialist. As a beauty specialist he may find himself asked to provide materials which as a chemist he can make, but of which as a dermatologist he is a little uncertain whether to approve. Fortunately, as he says, medical men are beginning to take an interest in the subject and the cosmetic chemist may be relieved of some of his worries.

The cellulose industries are among those that are concerned about their raw material. When the use of rags for paper making gave place to wood, few could have foreseen the immense quantities that would be needed. The result was an imminent shortage, but fortunately, systematic re-afforestation has now become the rule, so that the only limit to supplies is the speed with which the new timber can be grown from seed. Moreover, new sources of supply are being discovered, such as esparto grass, sunflower stalks, straw, bamboo and waste cotton stalks. Concurrently with this, however, there are springing up new industries that are also based on cellulose and which are increasing in their demands for raw material. The position does not seem to be in any way serious—though we must take into account the fact that this country is largely dependent upon imports for cellulose materials—but requires planning for the future and the utilisation of any by-products from other industries that may be available. Dr. J. Grant, in his excellent survey of the subject, points out that the utilisation of these alternative raw materials brings the need for new methods of manufacture, which essentially consist of the isolation of the cellulose; in theory any source of cellulose can be used as a raw material provided the non-cellulosic materials can be removed. Among the major trends of the cellulose industry in the future, Dr. Grant forecasts a concentration on the scientific aspects of cellulose production partly to utilise diverse raw materials and partly to enable " speciality pulps " to be produced for specific pruposes.

Dr. H. A. Thomas's paper

Canada to-day is being studied to a much greater extent than heretofore from a point of view of her potential capacities as a source of necessary materials in the case of a national emergency.

—Mr. Victor G. Bartram.

on the cellulosic textile industry is in a sense complementary to that of Dr. Grant, for it shows the immense amount of work that must be done upon the cellulose in order to manufacture finished goods for the market. This paper leads to the reflection that between the first discovery of a new process leading to the grant of master patents, and the complete development of the process it may be necessary to solve problems greater than those involved in the discovery of the original process. With the ever-growing demands for better materials and the ever-changing fashions of the cellulose-textile industry it is impossible to remain satisfied with even the greatest achievements. Those who read Dr. Thomas's paper will be made immediately aware of the manifold problems of production of rayon, processing, dyeing, finishing and testing which he and his colleagues have had to solve in order to produce the synthetic goods which now add brightness to a somewhat drab world.

The last 20 years, we are told by Messrs. J. T. Martin and F. Tattersfield, have shown unparalleled progress in the use of insecticides and in research upon the subject. The account given by these authors fully bears out their statement and shows, moreover, the value of the work upon many branches of agriculture and horticulture. Hydrogen cyanide retains its popularity and as yet there appears to be no fumigant that will be innocuous to human beings. The heavy naphtha from coal-tar seems to have possibilities, but these remain to be proved. Dr. H. Martin disagrees with the school of thought which suggests that treatment with fungicides should give place to the introduction of resistant varieties of crop plant and the maintenance of growth conditions encouraging resistance; on the contrary, his careful survey leads him to the conclusion that economic reasons will ensure the survival and development of fungicides and that the prospects are good when more is understood of their action and of the factors contributing to their efficiency. The immediate future of pest control appears to lie in the introduction of known and established active constituents in new forms, easier to use and better than the older insecticides and fungicides.

Sir E. J. Russell examines the pressing problem of soil erosion to which reference has been made in these columns on more than one occasion. It is cheerful to hear that, in spite of the pessimists, he can find no evidence of deterioration in the soils of this country as regards their fertility. The authors of all the papers and the Society are to be congratulated upon a distinct addition of value to industrial literature.

NOTES AND COMMENTS

U.S.A. Trade in Oils and Fats

ACCORDING to a recent address by Mr. C. E. Lund, of the Oils and Fats Section, Bureau of Commerce, U.S.A., it is expected—when the final figures are in—that there will have been little change during 1938 in the U.S. consumption of oils and fats, edible and industrial, and that the 1937 figure of nine billion pounds (over 4,000,000 tons) will be maintained; and although imports for last year suffered the heavy decline of a billion pounds (nearly 500,000 tons) this was fully compensated by increased home production of butter, lard and tallow, and of soya bean, cotton, corn (maize) and groundnut oils. He thinks, indeed, that the U.S.A. could be self-supporting in the matter of oils and fats, mainly by increasing hog production; but believes it a better policy to import oils and fats which can be produced more cheaply in other countries—the real basis of international trade—supported by Trade Agreements like those with the United Kingdom, Cuba, and others actual or intended. If U.S.A. crop production is up to average this year and next it is probable that total domestic output of oils and fats in 1940 will be the largest on record.

The Value of Personal Contact

DURING the recent Anglo-Swedish trade talks emphasis was laid by the Swedish delegates on the importance they attached to visits to Sweden by principals of British firms or their technical advisers to study at first hand the special needs of Swedish customers. Particularly so far as chemical plant is concerned they suggested that British suppliers should improve their contact with Swedish users and British representatives should pay frequent visits to Sweden. Personal contact is such an obvious principle of enlightened trading that one finds it difficult to explain the necessity of its practice being continually emphasised. The fact that leaders of commerce and industry frequently find occasion to do so suggests that insufficient attention is being paid by manufacturers to so valuable an aid to international trade. The Swedish business men have indicated their desire to receive British representatives and there is no reason to doubt that other countries abroad would be similarly inclined. No better example of the manner in which trade relations between this country and those abroad can be encouraged by personal contact can be given than by the recent talks between manufacturers of Britain and Sweden. A spirit of harmony prevailed throughout the discussions and at the conclusion Mr. Peter Bennett, president of the Federation of British Industries, reported that he was sure they could look forward to a quite substantial increase in the sales of many British products to Sweden.

The Exeter Meeting

THE annual meeting of the Society of Chemical Industry held at Exeter this week was unusual in being held in a locality not immediately controlled by one of the Society's Local Sections. The Society's work, so interwoven with that of the great industrial centres, has penetrated but little in the South-West of England and it is hoped as a result of the present meeting to establish closer relations with those engaged in the agricultural and rural industries. The breaking of new ground might well result in the formation of a local section of the Society for the South-West Counties of England, and the matter is under consideration. A feature of this year's meeting was the symposium on " The Trend of Progress: Where are we Heading?" which was in effect a continuation of the symposium held at the Glasgow meeting last September. An interesting point about the symposium was that the contribution on cosmetics was the first that have ever been made to the Society on that subject. Mr. Redgrove said that he was glad that recognition had now been given to cosmetics as a definite branch of applied chemistry. As usual, the social events of the programme were varied and thoroughly enjoyable; one need hardly add that the organisation was of the highest order.

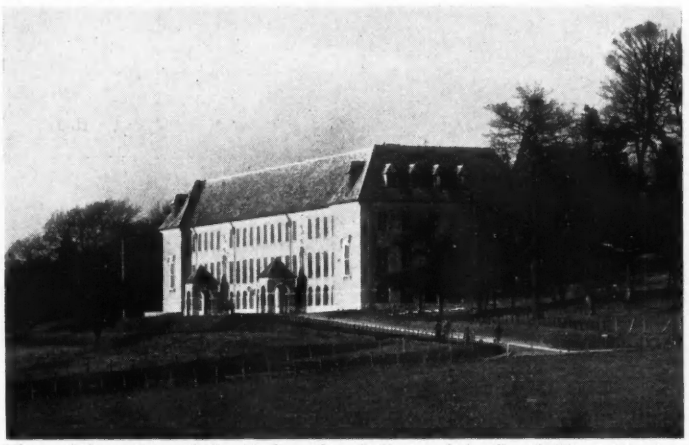
THE S.C.I. MEETING AT EXETER

Proceedings of Annual General Meeting—Election of Officers—Report of Council

THE 58th annual meeting of the Society of Chemical Industry was held at Exeter on July 10-15, and was attended by more than three hundred members and guests. On the evening of the opening day (Monday) there was a reception by the President, Mr. Victor G. Bartram, and by the Deputy-President, Viscount Leverhulme, and Lady Leverhulme at the Rougemont Hotel.

The annual general meeting was held on Tuesday morning in the hall of the Washington-Singer Laboratories, University College of the South-West, when the Mayor of Exeter (Mr. R. Glave Saunders) and Dr. John Murray, Principal of University College of the South-West, made addresses of welcome to which the president responded. After confirming the minutes of the 57th annual general meeting, 1938, the following officers were elected for the session 1939-1940: President: Professor J. C. Philip, F.R.S., Vice-Presidents: Mr. V. G. Bartram (retiring president), Dr. William Cullen, Dr. J. J. Fox and Dr. R. Lessing.

Mr. H. J. Pooley, general secretary, then presented the annual report of Council. The report stated that the year had been distinguished by a degree of activity in all sections of the Society's work greater than was shown in the records of any previous year. The steady progress in re-establishing the membership figures reported in the last few years had been maintained, but, it was added, the process must accelerate appreciably before satisfaction could be reached. The membership, reported at the end of 1937 as 3,907, had now grown to 3,975 at the end of 1938.



View of the estate of the University College of the South-West, Exeter, showing the Washington Singer Laboratories (left) and Roborough Library (right).

The following changes had now taken place in the officers of the sections and groups:—

Section	*Retiring Chairman*	*New Chairman*
Bristol	Dr. A. C. Monkhouse.	A. Sanders.
Edinburgh	A. M. Cameron.	Prof. J. Kendall.
Glasgow	Dr. I. Vance Hopper.	James Simpson.
London	Dr. R. Lessing.	Dr. T. H. Durrans.
Manchester	C. M. Whittaker.	Dr. W. J. S. Naunton.
Montreal	Dr. S. G. Lipsett	Dr. Leon Lartie.
Nottingham	W. Woodhouse.	H. Calam.
Ottawa	Dr. A. Linton Davidson.	A. A. Swinnerton.
South Wales	George Madel.	Frank Bird.
Toronto	H. D. Cameron	Prof. R. R. McLaughlin.
Chemical Engineering	Wm. Russell.	H. W. Cremer.
Food	Prof. H. Raistrick.	E. B. Anderson.
Section	*Retiring Secretary*	*New Secretary*
Birmingham	George King	R. S. Potter.
Liverpool	J. S. Towers.	Dr. L. J. Burrage.
London	Dr. A. J. V. Underwood.	R. Taylor.
Montreal	O. A. Hutton	D. C. Lloyd.
Food Group	E. B. Anderson.	Dr. J. W. Corran.

The meetings of the Council throughout the session had been well attended. Members in Canada and America had been fortunate in having the president, Mr. Victor G. Bartram, with them until the month of May. He had visited the sections freely and the Society had been able by his attendance at the major functions of other organisations in both countries to express its goodwill impressively in a manner which distance had usually denied it. Lord Leverhulme and Mr. Calder had deputised for him both in Council and committees, and at many social and technical functions. They had fully maintained in this way the cordial relations of the Society with other organisations.

The year had shown a period of increased activity among the local sections, both at home and abroad. A tendency was noticed to increase the numbers of meetings, and often to increase the numbers of papers presented. In general this had resulted in greater expenditure in publishing the material offered, a cost that would decline when the new rule, limiting the length of communications took effect. The number of meetings held jointly with other bodies and with the subject groups had shown an increase.

Each of the four subject groups has concluded a session of marked activity and their membership had increased. All the activities of the Chemical Engineering Group had been maintained, and the membership had increased by 41 to over 500. Ten ordinary meetings had been held, six in the country and four in London; nine had been joint meetings, and many had been associated with visits to works. The phenomenal increase in the membership of the Food Group from 539 to 721 was not entirely accounted for by the activities of the panels. Both panels had advanced quickly into full activity and now assumed responsibility for a definite proportion of the group's programme. The membership of the Plastics Group had increased through the year by 29 to a total of 287. The programme had consisted of nine formal meetings, including three with the sections in Nottingham, Liverpool and Birmingham, respectively, and with three other societies. The group had participated by invitation in several conferences of other bodies. The informal discussion suppers, of which this group had made a feature had been held with the usual success on three occasions. The fifth year of the Road and Building Materials Group showed a membership figure of 260, a number which could have been materially increased by greater support from municipal and county officers, to whom the group's work should specially appeal. A successful programme of technical meetings had been completed; the papers had attracted large attendances.

The income and expenditure account showed that the total normal income was, in round figures, £24,921, which, with the grant of £410 from the Messel Fund and the contribution of £800 from the Chemical Council, brought the total income to £26,131, a figure £2,195 less than the expenditure. The total income of £24,921 was £995 in excess of the income for 1937, representing chiefly an increase of £186 from membership and £743 from the publications of the society. The total expenditure at £28,325 was £1,750 higher than last year and it was obvious that one factor was responsible—the increase by £2,397 in the cost of the society's publications.

From the Presidential Address:

CANADA—Her Resources and Industries

By
VICTOR G. BARTRAM

CANADA has been abundantly favoured in her endowment of natural resources. Agriculture is the chief single industry of the Canadian people, employing nearly one-third of the gainfully occupied population. Canadian farming is of every kind. But it is chiefly in respect to the principal grain crops, and especially of wheat, that agricultural progress has been most remarkable. Fifty years ago the area under field crops in Canada was only 16 million acres, compared with 58 millions to-day, an increase of 272 per cent. It may not be inappropriate to indicate the importance of Canada to the Empire's food supply. Her production of foodstuffs may be measured by adding the value of primary agricultural output, the value of fisheries, and the net value of manufactured foods. In 1937 this total amounted to $1,250 millions of which $300 millions, or one-quarter, was exported to the United Kingdom and $21 millions to other Empire countries.

Mr. Victor G. Bartram.

Mining has experienced an advance even more phenomenal than agriculture. Fifty years ago, Canada's mineral output amounted to little more than $10 millions while in 1938 it totalled $445 millions, a truly remarkable increase which has placed mining next to agriculture among the country's primary industries.

Out of every $100 worth of gold produced in the world in 1937, Canada supplied $11 worth; she has a virtual monopoly of nickel, her mines yielding 90 per cent. of the world's total; she supplies more than half of the platinum metals, 12 per cent. of the copper and lead, and 10 per cent. of the zinc. Among all countries she stands first in the production of nickel and of platinum, second in radium, third in gold, copper and zinc, and fourth in lead.

Although overshadowed by the metals, the recovery of non-metallics is not unimportant. In bituminous coal, which in 1938 ranked fourth in output value amongst all her minerals, Canada has vast resources estimated at one-sixth of the world's reserves. In asbestos, the deposits of Eastern Quebec are rivalled only by those of Southern Rhodesia and Russia.

Canada's Oil Position

In view of the present world situation, Alberta's performance is the principal and perhaps the most encouraging item of information regarding the oil situation within the Empire. In 1937 Canada's percentage of Empire production was 7.1; in 1938, it had risen to 13.8. Official figures for the latter year put Trinidad first in the Empire, followed by Bahrien, Burma, and Canada. Had it not been for the drastic proration of output put into force in Turner Valley during the last three months of the year, it is probable that Canada would have advanced to second position.

In iron ore, the recent discoveries are most impressive. Much significance is attached to the announcement of recent drilling operations at Steep Rock Lake in Northern Ontario. Though exploration is in its early stages, it is now estimated that this deposit carries a tremendous tonnage of high grade and really accessible hematite ore.

Until 1930, when they were surpassed by the mine, the extensive forests of Canada were second only to the soil as a source of wealth. About one-third of the Dominion is heavily wooded. In its forest resources, Canada is at least the third richest country in the world. For years the forest products of Canada came first in the list of exports and they still rank third to those of the soil and the mine. The manufacture of sawn lumber is, next to pulp and paper, the most important industry which depends on the forest for its raw material. The pulp and paper industry ranks first among Canada's manufacturing industries. In no other country are its necessary raw material requisites of wood, power, and pure water so favourably situated, with respect to each other and to world markets.

Outstanding in Canada's endowment of natural resources are her water powers. About 40 per cent. of all-electric power is used in the manufacture of pulp and paper, the greatest single consumer. Electro-chemical and electro-metallurgical processes use about 10 per cent. of the electricity output, chiefly in the manufacture of electric furnace products, such as calcium carbide, cyanamide, artificial abrasives and ferro-alloys in the electrolytic refining of metals, in the electrolytic recovery of caustic soda, chlorine and hydrogen, and in the manufacture of synthetic ammonia fertilisers. In the mineral industries, hydro-power has contributed in no small measure to successful development.

Tremendous Advance in Factory Operations

In common with all other lines of endeavour, there has been a tremendous advance in factory operations in Canada in recent years. The manufacture of chemicals, apart from the allied or process industries, ranks among the important manufacturing groups in Canada and in recent years it has shown considerable growth both in volume and diversity of output. It now supplies about 60 per cent. of the country's chemical requirements and in addition makes a substantial contribution to the export trade. Although chemicals are produced in 60 or more establishments, the field is dominated by a few large companies, of which six account for 65 per cent. of the total output. Canada is fast becoming an important factor in the world's chemical industry. With her basic natural resources, cheap hydro-electric power, it is expected that she will, as time goes on, further develop as a producer of chemical products. Among the principal chemicals being produced in Canada to-day are sulphuric acid and by-products, caustic soda, chlorine, synthetic ammonia, hydrogen, nitrogen, nitric acid, sodium sulphate which occurs in abundance in the lakes of Western Canada, acetic acid, acetone, acetic anhydride, acetylene black, and vinyl acetate resins, and cyanamide.

In addition to the foregoing list many other chemical products are being manufactured in various places in many small undertakings. It is hoped that these developments will find a still greater basis from which Canadian chemical production can further expand. With the existing political situation in Europe, Canada is being looked upon with considerable interest as a country which has the necessary resources, man power and technical ability to develop further those essential chemical products which are so necessary to the well-being of the Empire.

Personal Reminiscences of Chemical Research

Sir Gilbert Morgan's Medallist's Address

IN the address delivered by Sir Gilbert Morgan on receipt of the Society of Chemical Industry's Medal at Exeter on Tuesday, he said that his first introduction to chemical research took place at the Finsbury Technical College in the private laboratory of Professor Meldola, who was then assisted by Mr. F. W. Streatfield. At that time those two chemists were carrying on their well-known researches on diagoamino compounds. At the end of Sir Gilbert's college career, the Professor recommended him for a post under Mr. Robert Holliday, of the well-known firm of colour makers at Huddersfield, for whom Meldola and Streatfield were engaged on consulting work from time to time. With that firm he was engaged on many problems of dyes and dye intermediates. "These researches and works processes did not, however, completely absorb my capacity for chemical reading and I noticed during this period that a new branch of the science—namely, physical chemistry—was coming to the front and with some reluctance I decided to give up a work's career and return to college in order to continue my scientific studies. I made this change in 1894."

Sir Gilbert T. Morgan.

Having completed the Associateship course at the Royal College of Science, Sir Gilbert said that he carried out researches under Professor, afterwards Sir William Tilden on the bromination of pinene and on the soluble castohydrates present in germinating wheat. He was soon after appointed to the leading staff of the Royal College and resumed certain investigations started in the works; condensations of aldehydes and aromatic amines and studies of the diago reaction among aromatic diamines. In 1904 he was joined by Miss Micklethwait with whom he collaborated for nine years. The work, which covered a wide field, included various studies of the diago reaction, the preparation of organic arsenicals and antimonials, and the examination of certain co-ordination compounds of coumarin.

Residual Affinity and Co-ordination

Describing his researches on residual affinity and co-ordination, Sir Gilbert said: "Already in 1906 I had noticed that the addition of platinic chloride to a saturated hydrochloric acid solution of coumarin determined the separation of a yellow crystaltine coumarin platinichloride. This oxonium salt and several other analogous compounds were isolated and analysed and as the explanation of their constitution based on the quadrivating of oxygen did not appear to be sufficiently explanatory I began to study the co-ordination which had been propounded by Werner in 1893. I became converted to his views and the first paper on the co-ordination compounds of vanadium was published with H. W. Moss in 1913 to be followed by another with the same collaborator in 1914. In the latter communication we described scandium acetylacetone. Further work on metallic acetylacetones was interrupted by the war, but afterwards, in 1919, on arrival in Birmingham, a systematic study of the interactions of acetylacetone and other β-diketones with various non-metallic and metallic chlorides was begun in collaboration with Dr. H. D. K. Drew. With no preconceived notion of what to expect we embarked on a comparative study of the action of selenium and tellurium tetrachlorides on acetylacetone. Ultimately we found that co-ordination played no direct part in these reactions, which, however, revealed in a remarkable manner the tantomeric changes to which acetylacetone and its analynes are prone." Sir Gilbert added that during the Birmingham period considerable attention was devoted to the chemical constitution of the lakes of mordant dyes. A good deal of this work was carried out in collaboration with Dr. J. O. Main Smith and considerable light was thrown by their joint researches on the constitution and mode of formation of the colour lakes derived from mordant and acid mordant dyes.

Turning to researches on synthetic resins, he continued: "While the Chemical Research Laboratory was in course of construction an investigation on the phenolformaldehyde resins was started in Birmingham with the aid of Mr. A. A. Drummond. We examined the condensations between formaldehyde and the higher phenols, such as *m*-cresol and *m*-5-xylenol using alcohol (methylated spirit) or acetone as the medium." Sir Gilbert pointed out that owing to the far-sighted policy of the founders of the Chemical Research Laboratory, the scientific staff were encouraged to tackle long-range problems without regard to their immediate utility. "This scientific object was kept fully in view in the tar section under the supervision of Mr. D. D. Pratt. In this section, which is the largest in the laboratories, several years were spent in acquiring accurate information regarding the constituents of low temperature tar about which comparatively little was known 14 years ago. Yet this scientific knowledge proved before long to be of considerable practical value for it paved the way to the discovery of an important wetting agent, Shirlacrol, and furnished a ready explanation of the corrosive action of modern tars on present-day tar stills." Among the other researches carried out at the laboratory described by Sir Gilbert at the close of his address, were researches on coal tar intermediates and high-pressure chemistry.

A TEST FOR NITRITES

An Italian chemist, Casolani, reports that either *o*-*p*-toluene diamine or *m*-toluidine in acetic solution are excellent indicators of the presence of nitrous acid or nitrites in drinking water. The former is used by adding a few drops of the solution to the water, when nitrites will give an orange-red colour. Ferric salts will produce the same colour, however, so that it is necessary to add a little ether. This will colour yellow if the colouration is due to nitrites, but not if due to ferric salts. A few drops of the *m*-toluidine solution prepared by dissolving 3 grams in 100 cc. of a 5 per cent. solution of acetic acid, added to the water to be tested causes it to turn yellow if nitrites are present. This yellow will deepen rapidly to orange and finally to a red brown. This colour is largely soluble in ether, but if the water and ether is acidified by the addition of a few drops of hydrochloric acid, the colour changes to a red orange and remains soluble only in the water. Ferric salts will give the same original coloration, but they are insoluble in ether.

Society of Chemical Industry

Annual Dinner

THE 58th annual dinner of the Society of Chemical Industry was held at the Rougemont Hotel, Exeter, on Wednesday. The President, Mr. Victor G. Bartram, was in the chair and about 250 members and guests were present.

Proposing the toast of the Society of Chemical Industry, Sir Frank Fletcher said that he knew nothing about industrial chemistry, but the general secretary had forwarded to him advance copies of the papers to be read at the meeting. He had been left full of admiration for the expert knowledge of the authors and even more for the audience who had heard and understood them. He felt like a solitary soul amongst a host of scientific prophets.

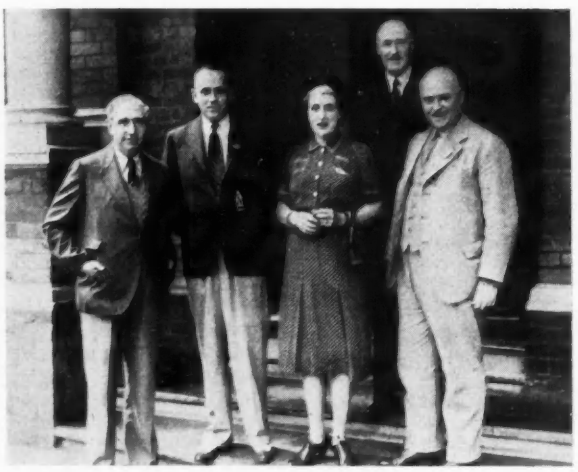
Mr. Victor G. Bartram, replying, thanked Sir Frank for the kindly way in which he proposed the toast. He expressed the thankfulness of the visitors to Exeter for the delightful time they had spent. Dealing with the Society's affairs he said that the annual report showed a very satisfactory state of affairs. Unfortunately during the year he had to be in Canada for most of the time, but he could not have had two more enthusiastic and able supporters than Lord Leverhulme and Mr. Calder. He said that within two or three years the Society was going to have a joint American-Canadian visit so that all the many friends within the Society on both sides of the Atlantic could get together. The toast of the guests was proposed by Professor J. C. Philip, the president elect. He made special reference to Dr. Lampitt, Mr. Calder, Professor Roberts, Dr. Vargas Eyre, Mr. Gibson and Mr. Davidson Pratt. He described them as pluralists because of the many honorary offices which they held and which brought them into the category of officials' guests. He paid special tribute to the work and activities of the Mayor, Sheriff and Town Clerk of Exeter in making the Society's stay in the city so enjoyable and mentioned the officials of the University College of the South-West in the same connection. Responses to the toast were made by the Mayor of Exeter, Dr. John Murray, Principal of University College of the south-west and the Right Hon. R. B. Bennett, ex-Prime Minister of Canada.

Among those present were: Lionel Andrews (President, Canadian Chamber of Commerce), the Rt. Hon. R. B Bennett (ex-Prime Minister of Canada), R. R. Bennett, Professor H. T. S. Britton (University College, Exeter), H. H. Brown (Engineer and Manager, Exeter Gas Light and Coke Co.), W. A. S. Calder (Past President: Pres. Institute of Chemistry), Dr. S. C. Carpenter (the Very Rev. Dean of Exeter), Dr. F. H. Carr (Past President), P. C. Chaumeton, W. P. Cohoe (Chairman, American Section), A. Linton Davidson (Chairman, Ottawa Section), L. K. Elmhirst (Dartington Hall, Member College Council), Dr. J. Vargas Eyre, Sir Frank Fletcher, A. J. Gibson (President, Oil and Colour Chemists' Association), F. J. Hambly (ex-Chairman, Canadian Council), Dr. L. H. Lampitt (Hon. Treasurer: Chairman, Chemical Council), the Rt. Hon. Viscount Leverhulme (Deputy President), Francis Lewis, H. L. Littler (Warden of Reed Hall), R. Glave Saunders (Mayor of Exeter), Eric Moon (Organising Committee), Sir Gilbert Morgan (Past President), Dr. John Murray (Principal, University College of S.W.), H. E. Mussett, G. J. Newman (Town Clerk of Exeter), J. F. Oliver, J. B. E. Patterson (Organising Committee), Professor J. C. Philip (President Elect), H. J. Pooley (General Secretary), J. Davidson Pratt (Hon. Foreign Secretary, General Manager, A.B.C.M.), H. S. Redgrove, Professor W. H. Roberts (President, Society of Public Analysts and other Analytical Chemists), H. A. Scott (Canadian Government Trade Commission), W. T. Slader (Sheriff of Exeter), T. W. Smith (Chairman of Canadian Council), Dr. G. S. Whitby (Director, Chemical Research Laboratories, Teddington), S. Whyte, A. K. Woodbridge (Registrar of University College of S.W.), and C. B. Woodley (Secretary, British Association Chemists).

KAOLIN PRODUCTION

Rock Kaolin mining on a large scale is to be started in the Mossel district shortly by a leading Cape Town company. Experiments have been carried out during the last two years, and reports received indicate that it is highly suitable for the purpose for which it is required. An option has been taken on a farm 19 miles from the town, and it is stated that plant costing £20,000 will be installed there for mining and preparing the kaolin. It is expected that much of this clay will be used in local chemical industries, and some may be exported for bleaching and paper-making processes.

Delegates to the Meeting welcomed by the Mayor of Exeter, Mr. R. Glave Saunders, at the University College of the South-West. In the front row of the group can be seen Mr. W. A. S. Calder, Mr. V. G. Bartram, Lord Leverhulme, Professor J. C. Philip, Sir Gilbert Morgan and Mr. L. H. Lampitt.



Lord Leverhulme, Mr. V. G. Bartram (President), Mrs. T. W. Smith, Mr. T. W. Smith (Chairman of the Canadian Council) and Mr. H. J. Pooley (general secretary) at the entrance of the Roborough Hotel.

The Trend of Progress : Where Are We Heading ?*

THE CELLULOSE INDUSTRY

By
JULIUS GRANT, M.Sc., Ph.D.

Dr. Julius Grant.

THE premier place occupied by wood as a source of cellulose has resulted naturally in intensified scientific research into the methods of pulp production used for this raw material. Originally, three main processes were operated, namely, the acid process (for sulphite pulp), the alkaline process (e.g., for kraft pulps), and the mechanical process (e.g., for pulps suitable for newsprint). Each of these types of pulp has made possible, in its own way, the development of different branches of the paper industry, and in the course of time it has been found how these processes can be modified or controlled, so as to produce at will pulps having definite characteristics which render them particularly suitable for the purpose for which they are required.

Wasteful Policy Corrected

In these early stages, and one may say that they terminated so recently as about 1920, little thought was given to the sources of the raw material from which the pulps were obtained, namely, the forests, and in many large pulp-producing countries these were exploited without thought for the future. Within recent years, however, there has been ample evidence that the wasteful policy of cutting wood for pulp without taking steps for re-afforestation is being corrected, and although the effect of such a change in policy will not pull its full weight for many years, there is no longer any danger of a shortage for this reason alone. Increased and systematic re-afforestation may, in fact be regarded as one of the future trends of this branch of the cellulose industry.

It seems, therefore, that from this point of view the paper industry has little to fear from an inadequacy of raw materials. There is, however, another point of view, namely, that of the industries which compete with paper making for the world's cellulose supplies. The principal of these is the rayon industry, but there are others which, though small as yet, are increasing in magnitude. The rapid growth of the rayon industry requires no emphasis here, but one of its most interesting features is the increasing use being made of cellulose derived from wood.

For certain of the rayon processes, and notably the acetate process, cellulose obtained from cotton linters has been found in the past to be the most desirable, and to a great extent this still applies. Nevertheless, acetate rayon can be made from sulphite wood pulp, whilst the latter pulp is definitely preferable for the manufacture of viscose rayon. There is consequently a natural tendency for the demands on such pulp from this direction to be on the increase; over 30 per cent. of the world's output of bleached sulphite pulp was in fact used in this way in 1938. From the point of view of the manufacturer of such pulps this tendency is probably a desirable one, since sulphite pulp for rayon commands a higher price than the sulphite pulp required by the paper maker, and moreover it can be produced by the pulp mills with relatively little additional equipment or trouble.

Among the competitors for wood pulp supplies other than the rayon industries can be included moulding-products in which the wood pulp is mixed with an adhesive and cast into moulds for the purpose of manufacturing parts for cars, decorative articles, and constructional materials; in the last-mentioned case a considerable degree of strength is obtainable by incorporating so-called fibrous cements. An entirely different type of application is represented by facial tissues and toilet requisites; the wood pulp then undergoes a form of after-process so as to raise the cellulose content by eliminating non-cellulose impurities. The impregnation of wood pulp with synthetic resins is the foundation of substitutes for wood and metal in many of their applications, and similarly impregnation with rubber latex enables substitutes for leather and materials for fancy articles to be made; yarn or string has also been manufactured from wood pulp, or paper after rolling or twisting it in the wet or dry state. Sponges are another development which may be noted in this connection. The production of foodstuffs and sugars by the hydrolysis of cellulose with acid followed by fermentation to produce alcohol for power purposes should also be mentioned among the uses of cellulose. However, such applications hardly rank as competitors of the paper-pulp industry, because they are usually applied to by-products of the cellulose industry or to sources of cellulose which cannot be used for paper making. Cellulose derivatives may also be converted into plastics of which the most familiar is celluloid, and they are also the basis of certain types of high-explosives.

Future Prospects of Wood Pulp Supplies

The considerations outlined above have of necessity given rise to a certain amount of speculation in the paper industry as to the future prospects of wood pulp supplies. However, even if we admit these increased demands on the production of cellulose, the other side of the picture is sufficiently reassuring. In the first place there are the tremendous forest reserves of the world, some of which have been barely exploited. Woods hitherto considered suitable for making only certain types of paper are now being investigated. We must also take into consideration the possible use for the production of cellulose of materials other than wood. In certain parts of the world where there are no forests which are suitable or adequate for wood pulp, experiments with local fibres are being made. However, although many of the plants grow in considerable quantities, the possibility that they will become serious competitors to wood pulp is in most cases small. They occur as a rule in inaccessible districts, and from a chemical point of view they are often resistant to processing so that the costs of exploitation are rather high, although the raw material itself may be cheap and quickly replaced. Moreover, in many cases the type of pulp obtained is not suitable for all kinds of paper, and the higher grades of cellulose required for rayon production cannot easily be manufactured.

This brings us as a matter of course to trends in methods of processing wood and other papermaking fibres. There

* Extracts from papers presented at the Symposium held during the annual meeting are given on this and the following pages.

seems little doubt that the near future will see some important results from the work which has taken place along these lines in recent years. Moreover, the very extent of the untapped sources of cellulose already referred to, many of which require for their exploitation new methods of processing, will in itself provide the incentive for such developments.

Cellulose Processing on Industrial Scale

In the last few years there has been a noticeable change in the point of view of those who study the processing of cellulose on the industrial scale. The method in the past has, as a rule, been a dual-process, namely, first of all the cooking of the raw material by an acid or alkaline process according to the nature of the pulp required, and secondly a bleaching process which enables the desired colour to be obtained. It is now appreciated more fully that there is no hard and fast dividing line between these two sets of operations, even if as is often the case, the first is carried out in the pulp mill and the second in the paper mill, possibly on the other side of the world. This is because fundamentally the main object of both of these processes is the isolation of cellulose; this applies to rayon pulp manufacture to a greater extent than to pulp for paper making. In theory at any rate, therefore, any source of cellulose can be used as a raw material, so long as the non-cellulosic materials can be removed, and the value of the resulting pulp will depend on the efficiency with which this can be achieved without loss of yield or damage to the fibres.

In this conviction one may conveniently instance the chlorination process. Thanks largely to co-operation between the rubber and chemical engineering industries and to improved methods for the electrolytic production of chlorine, the chlorination method of cellulose production is coming into its own. Several processes of this nature have been described. They vary in points of procedure which although apparently only details, are actually of considerable importance; such, at any rate, are the claims of those responsible for the processes. It is not necessary, however, to discuss the relative merits of the different processes here. It suffices to say that suitable compromises between such processes will probably provide a key to the utilisation of many fibres which have hitherto been regarded as economically unsuitable for the production of pulp for paper making.

Reference must certainly be made to some of the results already obtained by these modified processes. One of considerable importance and interest in paper making is represented by bleached kraft pulp, and grades of outstanding quality are now available from the northern countries of Europe and from America. In this case the selective nature of the chlorination process has enabled both a high colour and strength to be obtained.

Experiments on Nitric Acid

It has already been mentioned that the first stage of any cooking process is usually treatment with an alkaline or acid liquor. In the past any reference to acid in this connection has almost invariably been intended to indicate the sulphite process, in which the pulp is cooked with a liquor containing calcium bisulphite and free sulphur dioxide. Here again, however, the pendulum has swung back to the days of the early experiments on the manufacture of pulp, because among some of the earliest reagents tested were mineral acids, and within recent years experiments have been carried out on nitric acid for this purpose. The engineering difficulties associated with the use of this acid were largely responsible for it being abandoned in the early days, and these difficulties have still to be completely overcome. If this can be achieved successfully it seems likely that pulps produced by a nitric acid process will become available, and according to reports from Japan promising results are obtainable with materials as widely different as pine, rice-straw, and bagasse, the general quality and yield being comparable with those of the ordinary sulphite process.

Another method for the isolation of cellulose which has not yet passed the laboratory stage is the extraction of impurities from the mildly processed raw material by means of organic solvents. This is an entirely revolutionary method, and has the obvious advantage that under conditions of selective extraction it should be possible to leave the fibre completely unharmed.

One factor of great importance which has assisted in the development of new pulps having specialised properties is the standardisation of methods for the evaluation of pulps. The advantages of this from the point of view of the relationship between the purchaser and the vendor need no emphasis. In addition it is now possible by means of an intelligent study, by laboratory methods, of the properties of pulps after beating for various times, to forecast not only how the pulp will behave in practice, but also in what direction modifications in manufacture should be made in order that the pulp should conform to a definite specification. This again will influence the trend of progress in the direction of making available pulps of a speciality nature.

After-Treatment of Finished Pulps

Within recent years a good deal of attention has been paid, notably in America, to the after-treatment of what have hitherto been regarded as finished pulps. The type of process used varies considerably. Thus, treatment with hot or cold dilute alkali or with cold concentrated alkali for suitable periods is favoured in most cases, but acid treatment is preferred in others. Progress on these lines has passed the preliminary stage, and it is now possible to strike a balance between a process which is so drastic that it removes the impurities, but also degrades the cellulose, and one which is so mild that it cannot remove all the impurities.

One rather important pointer of the trend of progress is the increasing attention which is now being paid to what may be termed waste products. In the first place, there is the utilisation of wood waste. Hydrolysis to sugar which can be used for the production of power alcohol by fermentation, or even as a foodstuff, has already been mentioned; lignin from the same source is used for the production of wood charcoal, or as a fertiliser; and waste wood may also be used as a source of distillation products or fuel gases or, if ground to wood flour, it serves as a filler in the plastics and linoleum industries. The uses of the by-products of the actual pulping processes are very numerous, and this applies particularly to the sulphite process, where considerable volumes of waste liquor are obtained, the chemical nature of which prevents them being discharged into any but tidal waters. The patent literature on this subject is vast, but examples which may be mentioned include its use in adhesives, tanning agents, as a binding agent for fuel briquettes and road materials, for the production of yeast food, and for constructional materials; it has also been used in fertilisers and for the production of vanillin and dyestuffs.

The alkaline processes yield a substance known as "tall oil," which is fatty and resinous in nature, and is used for the manufacture of soaps. Turpentine is another constituent which can also be isolated during the operation of this process, and lime or chalk is frequently obtained from the causticiser sludge produced during the recovery of the black liquors from the alkaline process.

Features of Future Trend

In conclusion, it seems safe to summarise the position by a statement that the future trend of the industries concerned with cellulose will be marked by the following features:—

(1) An increase in the quantity and variety of products made from cellulose pulp.

(2) An increase in the range of raw materials which can be used to supply this demand.

(3) Concentration on the scientific aspects of cellulose production, enabling speciality pulps to be produced (particularly from wood) for specific purposes.

(4) Increasing attention to ramifications of the cellulose industry, such as the utilisation of by-products and of waste paper, and to re-afforestation, etc.

THE CELLULOSIC TEXTILE INDUSTRY

By
H. A. THOMAS, B.Sc., A.I.C.

THE textile industry is at present passing through a phase of remarkable development in which chemical, physical, and physico-chemical discoveries in the field of cellulose are playing an important and indispensable role. Chemical and X-ray researches have given us considerable insight into the constitution of cellulose, and this knowledge has served as a sound foundation for progress in the cellulosic textile industry.

Progress with regard to sources of cellulose for viscose rayon manufacture is taking a different course in the democratic countries from that in the totalitarian states. The trend in the democracies is to select the wood pulp and control its quality even more rigorously than in the past, whereas in the totalitarian states the trend is in the direction of self-sufficiency, and therefore sources of cellulose which can be grown in those countries are being exploited.

An important recent development is the modification of viscose rayon physically or chemically. Physical modification of viscose rayon by recent developments of stretch-spinning technique has resulted in the production of a high tenacity viscose rayon. Courtaulds' "Tenasco" is a high tenacity viscose yarn produced by such a modification of the ordinary viscose spinning process. Physically modified viscose staple fibre with a crimp or curl is exemplified by Vistra XT (I.G.), Floxalan (Glanzstoff A.G.), Woolly Fibro V.D. (Courtaulds). Methods of producing these effects are described in the patent literature, and include treatment of the freshly coagulated desulphurised, and bleached viscose with superheated steam at 115° C., treatment of viscose (after coagulation) with meta-pyro, or polyphosphoric acids or their alkali salts, extrusion of cellulose solutions through pulsating spinning nozzles. Viscose rayon of woolly appearance is obtained by drying with alcohol instead of by hot air. Resin treatments can also be employed to fix a crimp.

Crimped Viscose Staple Fibre

Crimped and "voluminous" viscose staple fibre is produced by extruding the viscose solution into a sulphurous acid solution of equal parts of ammonium and sodium sulphites. The filaments are stretched, twisted, and fixed in sulphuric acid solution. Sulphur dioxide is evolved, and the yarn has a full crêpe-like appearance. Hollow-filament viscose rayon has been produced in the past by a similar process of evolution of gas within the filaments by the use of sodium bicarbonate in the spinning mass.

The blending of wool with viscose staple fibre gives an inexpensive yarn with desirable properties such as more lustre, and higher dry tensile strength than all-wool yarn.

Work on devising methods of giving viscose rayon an affinity for wool dyestuffs has followed the following three main lines:

(a) Mordanting viscose rayon with quaternary ammonium compounds so that the long chain cations are adsorbed on the fibre and form a lake with the negatively charged dye acid ions.

(b) Incorporation of proteins or basic substances in the viscose spinning mass.

(c) Treatment of the pre-formed viscose filaments with reagents designed to combine with the cellulose to introduce basic groups, or to form a basic resin in or with the cellulose.

Method (a) has not given results of practical value, since although the mordanted viscose rayon dyes to heavy shades with wool dyestuffs, the shades with acid dyestuffs are with a few exceptions of poor fastness to washing and light. The shades produced with chrome colours applied by the after-chrome process are of satisfactory fastness. Methods (b) and (c) have resulted in new fibres of practical value.

With regard to the processing of viscose rayon, the modern tendency is to conduct all of the wet treatments on the yarn in cake form. The important feature of this method of handling viscose rayon is that the expensive and lengthy process of reeling into skeins is completely eliminated.

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Various modifications in the acetylation of cellulose are described in the patent literature. A considerable amount of work has been conducted on methods of stabilising normal acetate rayon against hydrolysis by traces of the sulphuric acid which may be left in the yarn after production. Some interest has been shown in further acetylating or esterifying generally the normal acetone-soluble or "secondary acetate," e.g., with acetyl, propionyl or butyryl chloride. In this way mixed esters, e.g., cellulose butyro-acetate, possessing modified physical properties compared with normal acetate rayon are produced. Some progress has been made in the treatment of acetate rayon to confer wool-dyeing properties, with the object of facilitating dyeing of fabrics or blend yarns containing both wool and acetate staple fibre. There has not been the same intensive effort, however, as that applied to the basification of viscose.

The following represent the more important lines of development in the finishing section of the cellulosic-textile trade. Although non-creasing or non-crumpling treatments are not new, the first Tootal Broadhurst Lee patents on the treatment of cellulosic fabrics with resin components, e.g., phenol, or urea, and formaldehyde having been filed in 1926, there is considerable activity in this field at the present time. The basic principle of many of the modern processes evolved is the same, namely the impregnation of the fabric, usually cotton, linen, or rayon, with solutions of products which on subsequent heat treatment on the fabric produce a resin or polymer *in situ*, and also may react with the fibre. In the author's opinion developments in the application of rubber, both natural and synthetic, to textiles are likely to occur; there are many possibilities yet to be explored.

Use of Cellulose Esters and Ethers

An important feature of developments in the finishing of textiles is the use of cellulose esters and ethers. The commercially available cellulose derivatives for use in finishing are Tylose and Colloresine of the I.G., and Cellofas of the I.C.I. The uses of these products include treatment of cotton cloth from alkaline solution, followed by a run through acid, when a washproof linen-like finish is obtained. Cellofas can be employed in this way for the production of laminated fabrics, i.e., to act as an adhesive inter-layer.

The technique of stiffening fabrics by employing cellulose esters or ethers, either as an interlayer (i.e., analogous to the "filling" of a sandwich) or as woven threads, which are then plasticised, and finally hardened, has found considerable favour for semi-stiff shirt collars and cuffs.

OILS, FATS (OTHER THAN EDIBLE) AND DETERGENTS

By
P. W. TAINSH, O.B.E., M.A.

IT is of interest to note that it is not perhaps in the actual process, or, as some still regard it, the art of soapmaking that most progress has been made. Developments of the greatest value and practical importance, however, have taken place in connection with the main raw materials of the industry, oils and fats. In recent years our knowledge of the chemistry of these raw materials has been greatly enlarged. New sources of supply have been developed to meet the growing requirements to-day, and advances have been made in the method of treating the crude material from these sources to render it more suitable for the manufacture of products of the highest quality. The composition of oils and fats may be studied first from the point of view of the constituent fatty acids, irrespective of the manner in which these are combined with glycerine in the form of glycerides, and it is this aspect of the subject which is of most importance to the soapmaker.

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Although some success has been attained in attempts to solve the problem of obtaining fatty acids of satisfactory quality from hydrocarbon oils, the oils and fats used by the soapmaker, outside Germany at least, are still almost exclusively those of animal and vegetable origin. In recent years, however, considerable change has come about in the nature of these oils and fats, consequent upon the demands of other industries, and on the notable increase in the available supplies of certain important varieties. There are three main classes of fatty substances used by the soapmaker, namely:

(a) The tallow class, includng tallow and its substitutes.

(b) The nut oil class, comprising for the most part coconut oil and palm kernel oil.

(c) The soft oil class, represented by cottonseed oil, groundnut oil, soya bean oil, etc.

It is not so very many years since tallow was the one fat available in its class to the soapmaker, but now its place is shared by hardened whale oil and by palm oil.

Of the substitutes for tallow, hydrogenated oil has been in use for about 30 years. Various fish oils are available for hydrogenation, but the principal oil used for this purpose is whale oil, and this oil, hydrogenated under the correct conditions, can be regarded as an almost perfect substitute for tallow in soapmaking. Evidence has not been wanting during the last few years to show that the stock of whales is being rapidly depleted, and, while it is difficult to predict the future, it seems not unlikely that unless the industry can be subjected to rigid control and regulation, the end may not be so very far off.

Palm oil has a world production of about 500,000 tons per annum and is next in importance to hydrogenated oil as a tallow substitute in soapmaking. The increase in output may be judged from the fact that the total world's supply of palm oil has more than doubled during the last ten or twelve years.

Between 20 per cent. and 25 per cent. of the oils used in soapmaking belong to the nut oil class, of which coconut oil and palm kernel oil are the only representatives of any real importance. They are used to confer on soap certain properties connected with lather, solubility, and texture. While there has been a considerable increase in the world's supply of these oils, particularly coconut oil, the quantities used by the soapmaker have not varied much in recent years in relation to the consumption of other oils.

Among the soft oils used by the soapmaker, a useful oil is soya bean oil, although in proportion to the other soapmaking oils the quantity used is comparatively small. In the last ten years there has been an increase of about 50 per cent. in the world production of this oil and in 1938 an output of over 500,000 tons was reached.

Reference has already been made to the production of fatty acids from hydrocarbon oils. Actually, the manufacture of fatty acids by oxidation of high molecular weight straight chain hydrocarbons was proposed by Schall in a German patent as long ago as 1884. The idea did not become economically attractive until the period during and after the war, when there was a shortage of fats combined with an excessively high price. Since that time, Germany, in her efforts at self-sufficiency, has worked to produce synthetic fatty acids on a technical scale. Although the political urge has been less in other countries, work on these lines has been carried on also in America, Russia, and elsewhere. For the most part the required hydrocarbons have been sought in selected fractions of natural petroleum, but now suitable materials are stated to have been found also among the products of the Fischer-Tropsch synthesis. In the development of this method of producing fatty acids, the great difficulty, apart from cost, has been to obtain a presentable final product, since the by-products of oxidation are difficult to get rid of and possess a most persistent and offensive odour. Soaps are, however, being sold in Germany to-day containing synthetic fatty acids, and it is claimed that as the result of improvements in pre-treatment, in the catalyst used, and in the oxidation process, distilled fatty acids of satisfactory quality can be prepared. With coal as the raw material, synthetic fatty acid may be of value under war conditions, but otherwise in view of the low price at which the natural oils and fats can be produced to-day, it is difficult to imagine that they will ever find in the synthetic product a serious competitor. It has to be remembered also that we are at present dependent upon the soapmaking oils and fats for our supplies of glycerine, and any extensive replacement of natural fats by synthetic fatty acids in war-time would mean that glycerine also would have to be produced by synthetic methods.

During the last twenty years important advances have been made in the methods of treating oils and fats to render them suitable for soapmaking, and in particular bleaching and hydrogenation processes have been remarkably improved. The main development in connection with technical bleaching of oils has been in the application of activated bleaching earths. The progress made in technical hydrogenation during the last ten to fifteen years has been of great benefit to the soapmaker. Not only have improvements in the technique of hydrogenation resulted in a reduction of costs, but the knowledge we now possess of the factors involved in hydrogenation has enabled the hardened product to be so controlled that artificial fats eminently suitable for soapmaking are obtained.

The subject of raw materials cannot be dismissed without reference to the development of transport in bulk as it has affected the soap industry. Oils and fats were formerly handled largely in casks, barrels, and drums, whereas now

they are imported in ships' tanks, from which they are mechanically transferred to tank wagons. This change has resulted in the gradual and nearly complete disappearance of the once familiar melting-out process.

Another question of some interest in connection with soap-making raw materials is that of the use of preservatives. Most oils and fats contain natural antioxidants. When the oils, however, are submitted to any form of treatment, the tendency is for these antioxidants to be removed or destroyed, and there is still room for a really satisfactory antioxidant or preservative suitable for adding to oils when they have to be stored. The most effective preservatives so far known have an adverse effect on the colour of the soap, and therefore their application is limited. Research into the nature and properties of antioxidants has hardly yet begun.

The bulk of the world's soap is still made by the batch process, with but little change from the procedure used a century ago. The idea of producing soap by a continuous process would seem to offer valuable economies and has proved most attractive to inventors, but so far their efforts have had little practical result.

While no outstanding developments have taken place in the technical soap-boiling process, considerable changes have taken place in the processing of the soap. Impurities in the soap are being removed by centrifugal machines and by straining and filtering devices. The methods of cooling soap have been greatly modified. In the most rapid method, it is cooled as a very thin film on a drum through which cold water is flowing. In drum coolers noteworthy developments have taken place in connection with the thinness of the film, the elimination of ragged edges on the soap ribbons, and in the attaining of smoothness on both surfaces of the flake.

Improvements in mechanical soap driers have taken place in recent years, and improvements have been, and continue to be, made in the milling of dried soaps to produce flakes. With the granite rollers formerly used, satisfactory fine flakes could not be made, whereas with the latest temperature-controlled chilled cast-iron rolls, which have precision-ground surfaces, milled flakes having a thickness between one- and two-thousandths of an inch have been made.

Toilet soaps have been greatly improved from the point of view of quality, lathering properties, and non-cracking properties, and effective means have been found for maintaining the colours of the soaps and the freshness of the perfumes.

Soap powders, which at one time possessed a very low content of fatty acids and were used mainly along with hard soap, are to-day highly efficient detergents which can be used by themselves for the household wash. The fatty acid content is generally high, and the detergent effect, particularly in hard water, has been improved by the use of correctly chosen adjuncts, among which various salts of phosphoric acid have recently been included. Methods of manufacture also have altered, and various spraying processes have largely displaced the older method of grinding together the ingredients of the powder.

In this country and on the Continent an important section of soap powders includes those which combine the functions of washing and bleaching. These, containing, as they do, sodium perborate, present problems connected with stability and the regulation of their bleaching action, and developments in recent years have been concerned with the solution of these problems.

Many general improvements have been made in automatic or semi-automatic machinery for handling and packing processed soap products, but probably the most noteworthy in recent years has been the advance made in the speed and accuracy of the machines. Soap-stamping machines now handle up to 160 tablets per minute, soap-wrapping machines 140 tablets per minute, soap-cartoning machines 120 to 160 tablets per minute, weighing and filling machines for soap flakes 60 to 90 cartons per minute, and measuring and filling machines for soap powders, up to and more than 120 cartons per minute.

One of the latest developments in the detergent field is that of the so-called soapless detergents. The normal soaps are sodium or potassium salts of the carboxylic acids of straight chain hydrocarbons, and they possess the disadvantage that in hard water they react with the calcium and magnesium present to form insoluble soaps. In the soapless detergents the long hydrocarbon chain is retained, but by the introduction of a variety of solubilising groups other than the simple carboxyl group products are obtained which are not affected by hard water. In the last few years, the comparative merits of soap and the soapless detergents so far available have been very thoroughly investigated, and it would appear that for general purposes the newer detergents are still inferior to soap. None of them is particularly effective for the washing of cotton or linen goods. They are, however, specially suitable for the treatment of woollen fabrics, and in view of their lime-resistant properties, they are finding some limited application, particularly in the technical field. They are also excellent for shampooing purposes.

COSMETICS

By
H. STANLEY REDGROVE, B.Sc., F.I.C.

I HAVE found it useful in studying cosmetics to classify them into four groups, according to function: (i) the decorative; (ii) the corrective; (iii) the protective; and (iv) the curative or therapeutic. The decorative cosmetic is designed for decoration simply and solely. Corrective cosmetics, on the other hand, aim at hiding small imperfections and making good, for the time being, minor defects in the appearance and complexion. The function of protective cosmetics is indicated by the name. Face-powder, especially if it is of an opaque type, protects the complexion against the inclemencies of the climate. The curative cosmetic is, or let me say, should be, a medicine designed for external application. We enter the domain of dermatology, and the study of cosmetics of this type belongs, strictly speaking, to medical science. Unfortunately, medical men have neglected it. Hence the story of curative cosmetics is largely a story of chicanery.

Recent years have seen the placing on the market of numerous creams stated to contain this or that vitamin, including the so-called "vitamin-*F*," as well as those stated to contain various hormones. I seriously question their utility. At any rate, I would express the opinion that they have been marketed before the question of the action of these substances when applied to the skin has been fully investigated.

I return to a consideration of cosmetics of the first three types as more especially the concern of the cosmetic chemist rather than that of the dermatologist. In the past the manufacture of these articles has been primarily in the hands of the perfumers. Perfumers manufactured powders, soaps and other toilet requisites mainly as vehicles for their perfumes, often it must be confessed with little knowledge as to the nature of these vehicles, save in respect of their suitability as carriers for the perfumes.

During the past two decades, however, big changes have taken place and much progress has been made. The demand for cosmetics has very greatly increased, with the result that many firms have come into being whose sole business is their manufacture and marketing. The perfumers continue to manufacture perfumed cosmetics, and there is no reason why they should not do so. For their attitude towards cosmetics has changed. Their cosmetics are no longer mere vehicles for perfume. They are realised to possess an importance in themselves.

To make a good face-powder which will satisfy modern demands calls for the careful choice and blending of suitable basic constituents. Each will contribute some special character to the finished product, and of these one is needed to give opacity. When white lead fortunately fell out of favour, zinc oxide came to take its place. In 1920, I had the pleasure of introducing to the industry titanium dioxide as an alternative. The price of a suitably pure grade had already fallen to a figure which made this once costly chemical a practical proposition. Over zinc oxide, titanium dioxide possesses certain very definite advantages. First and foremost is its entire physiological inactivity. Moreover, although more opaque than zinc oxide, it is less dense. The utility as a white pigment for cosmetic use of titanium dioxide is not restricted to face-powders.

There have been notable developments in the tinting of face-powders. For producing the various tints, lake colours have tended to replace the use of water or spirit soluble dyes, owing to greater convenience in handling; but the earth pigments—ochres, boles, etc.—are definitely useful, though the modern tendency is to replace them by synthetic iron oxides. Both in respect of lakes and of synthetic iron oxides for use in cosmetics, developments may be anticipated: and, in my opinion, it is very desirable that there should be available, for use in the industry, a good range of innocuous lakes of *known* composition and of guaranteed purity. I hold further that these should not be barium lakes, and, indeed, should be barium-free.

Manicure is a branch of cosmetology which has developed recently in a remarkable manner, and one cannot fail to be impressed by the wide range of preparations now on the market for keeping the hands in good condition and for decorating the nails. The cellulose nitrate type of nail enamel has almost completely ousted the old-fashioned wax and powder polishes; but it is doubtful whether the ideal form of product for enamelling the nails has yet been devised. There is some degree of dissatisfaction with the majority of solvents employed, partly on the grounds of their usually unpleasant odours, but more especially on account of their "drying," i.e., fat-solvents, effect. This latter objection applies more especially to acetone, whose continued use appears to be doomed.

It may be questioned whether the ideal colouring matters for use in lipsticks have yet been discovered. To give indelibility, brominated fluoresceins, commonly known as "free acid eosins" or "bromo acids" have been employed, and enormous efforts were made to produce orange reds free from any bluish undertones. Now, however, that fashion has changed, the use of the corresponding iodine-substitution products ("free acid erythrosins") has become possible. The range of shades which can be got by means of substituted fluoresceins is definitely limited, and the colour is usually fortified by the incorporation of a lake pigment. The discovery of how to make a really indelible lipstick in not merely a limited range of shades, but in a range corresponding to that producible by means of lakes, would be decidedly welcome.

Modern fashions in hairdressing have brought a whole series of new cosmetic products into being. For use in the permanent waving process, both permanent waving reagents, usually aqueous solutions of alkalies, sometimes with the addition of reducing agents, such as sodium sulphite—and setting lotions are both required. It seems possible, although present preparations are effective, that the ideal product for the purpose has not yet been discovered. Another development in this connection of definite interest to the industrial chemist is the replacement of the permanent waving machine by sachets containing mixtures of substances which react exothermically when moistened, such as quicklime, mixtures of powdered aluminium with oxidising agents, such as sodium persulphate and other suitable substances, etc., for which various patents have been granted. Further developments along these lines may be anticipated.

Among modern hair-creams, we find examples representative of the two main types of emulsion, water-in-oil and oil-in-water. The former have better fixative powers, but are more difficult to shampoo off than the latter. Most hair-creams of the oil-in-water type are deficient in oil. Possibly, the ideal hair cream of this type, with a high oil content, has yet to be made.

Soapless shampoos based on detergents of a neutral character, stable towards both alkalies and acids, and which, therefore, permit desirable adjustments in *p*H to be made, represent a big modern improvement. The sodium and triethanolamine salts of lauryl hydrogen sulphate undoubtedly lead the way.

Perhaps, however, it is in the domain of cream manufacture that the biggest changes have taken place in cosmetic manufacture in recent years. To-day, the cosmetic manufacturer is confronted by an almost overwhelming array of emulsifying agents. Among modern emulsifying agents of known composition which exhibit good stability towards mild acids may be mentioned cholesterol and oxycholesterol, cetyl alcohol and stearyl alcohol, for the production of creams of the water-in-oil type, and sapamine salts and sulphated and phosphated derivatives of cetyl and stearyl alcohols, for the production of creams of the oil-in-water type. It is remarkable, however, that the industry still lacks a really good emulsifying agent for the production of fluid acid emulsions of the water-in-oil type. Work is desirable in this connection.

INSECTICIDES

By

J. T. MARTIN B.Sc., A.I.C., and F. TATTERSFIELD, F.I.C.

THE last 20 years have shown unparalleled progress in the use of, and the research on, insecticides. There is little question of the predominance of the arsenicals as insecticides in animal dips, and in horticultural and agricultural sprays, dusts, and baits. The action of Public Health authorities in insisting upon limits of tolerance of both lead and arsenic in food has stimulated the search for substitutes. With the exception of calcium arsenate, which has particular uses, the efforts to replace lead in its molecule have not shown outstanding success. Research has been largely concentrated particularly in the United States on the search for organic substitutes. The problem has proved peculiarly intractable, in that there have been divergencies, between the laboratory and field results.

Of the many hundreds of synthetic compounds tested as stomach poisons, phenothiazine (thiodiphenylamine) has aroused the greatest interest. L. E. Smith reports experiments which show that it is specific in its action to insects, some being highly resistant and others susceptible. The codling moth larva is one of the susceptible insects. The most promising results in attempts to replace lead arsenate in codling-moth (*Cydia pomonella*) control appear to have attended the use of nicotine bentonite. Nicotine alone or in combination with arsenate and petroleum oil has not in the past proved universally successful. Being a strong base it is capable of combining with bentonitic clays, to give a product of considerable stability which is a powerful larvicide, and thus it has been found possible to replace at least a portion of the lead arsenate in use. Recent reports indicate that when used with mineral or vegetable oils the bentonite—fixed nicotines are of the same order of toxicity as lead arsenate—are in many cases less phytocidal, and that they reduce the costs of spray residue removal.

In the search for organic substitutes for the arsenicals, no

simple relations have yet been found to link up insecticidal activity with chemical constitution. There seems to be little question that many of the sulphur products are of great interest as stomach poisons and repellents, and the thiazines (such as phenothiazine) would appear to have great usefulness if their stability, wetting, and adhesive properties are improved. For many years the most satisfactory permanent proofing method has depended on the application of certain proprietary protectants. Essentially these compounds may be regarded as colourless acid dyes possessing affinity for the fibre. Various fluorine derivatives, including sodium silicofluoride have been used.

Contact Insecticides

Contact insecticides operate by penetrating the integument of the insect. Those most commonly in use are of vegetable origin or derivatives of coal tar and petroleum. Nicotine, the rotenone-containing plants, pyrethrum, quassia, and petroleum have been used for insecticidal purposes for many years. The recent trend of events has been mainly to introduce more accurate knowledge of their chemistry, mode of application, and range of utility.

Much attention has been given to contact insecticides of vegetable origin, particularly nicotine, the rotenone-containing plants, and pyrethrum.

Nicotine is almost unique in that it acts as a stomach poison, by contact to insect eggs, larvæ, and adults, and also kills in the vapour phase. There is no question about its continued importance. Since nicotine is highly toxic to man, considerable attention has been devoted to those leguminous plants which over a long period have been used as fish-poisons by the natives of tropical countries, and which have been known to be insecticidal for nearly a hundred years. Derris was on the market in this country some 25 years ago, but it is only since the war that these insecticides as a class have aroused the world-wide attention of chemists and entomologists. This has been largely due to the isolation and the determination of the structure of their most potent active principle—rotenone. Other compounds of the same type were early isolated, notably deguelin, toxicarol, tephrosins, and deguelinols, and their structure determined. These compounds were optically inactive and their insecticidal power was inconsiderable. We now know that they had undergone chemical change in the process of extraction or were derived from patent substances occurring in the roots. More recently, other compounds have been isolated. This complexity does not ease the problem of the chemical evaluation of the plants, for although rotenone is the most potent, the other active principles cannot be neglected. The rotenone group of compounds has been found in many plants, in derris (spp. *Derris*) cube, timbo, haiari (spp. *Lonchocarpus*) in several species of *Tephrosia,* in *Mundulea sericea,* and in spp. of *Milletia.*

A present trend is towards the use of dusts and of *Derris* and *Lonchocarpus* extracts worked up into petroleum and fatty oil emulsions, and in view of the fact that rotenone is much less toxic than the arsenates to warm-blooded animals, it can substitute them on market garden crops. The fact that loss of toxicity takes place on exposure to sunlight and air is not entirely a disadvantage. These products now rank among the most important of insecticides and likely to remain so.

The flowers of *Pyrethrum* (*Chrysanthemum cinerariæfolium*) are unique in their insecticidal properties being comparatively harmless to man and characterised by great rapidity of paralytic action on insects. Although its insecticidal properties have been known for a long time, it is only during the last 10 years that its wide exploitation has taken place, particularly in the form of fly sprays. Although other compounds, e.g., rotenone, approach the pyrethrins in toxicity, no insecticide has yet been found which equals pyrethrum in knockdown effect. Important new uses of pyrethrum have recently been found. Pyrethrum loses its activity when exposed to sunlight and air. It was found at Rothamsted that the effect was due to oxidation and could be partially but not entirely prevented by the incorporation of antioxidants. In warehouses, however, where the illumination is not intense, the pyrethrinsed oil films are definitely protective for some time.

Many hundreds of organic derivatives and organometallic compounds have in recent years been tested as contact insecticides. It is too early yet to give a precise account of their present status, but since many laboratories are engaged in exploring their possibilities it seems very improbable that they will fall into the background. Among the inorganic compounds sulphur nitride has been found by Fulton to be highly toxic to insects and fungi; whether it will prove safe enough for large-scale use remains to be seen. There has been a valuable study of the *cyclo*hexylamine derivatives by Kearns and co-workers of which amyl-benzyl-*cyclo*hexylamine seems the most interesting.

Hydrogen cyanide and ethylene oxide remain the two most widely used fumigants in temperate countries, while carbon disulphide is employed mainly in the less industrialised countries. Chloropicrin is of value in fumigating machinery, while methyl formate has been used for certain food products. Carbon dioxide is now often used to reduce the fire risk of inflammable fumigants in place of carbon tetrachloride. Under certain conditions it appears to increase the toxicity of certain fumigants. Some experimental fumigation has been carried out with methallyl chloride. In house fumigation, *o*-dichlorobenzene is now less used owing to danger from residual low concentrations after airing. A fraction of heavy coal-tar naphtha has been used in place of it, the toxicity of which depends on several constituents. Its specification has recently been improved, and it is at present under investigation. Methyl bromide has been shown to have high insecticidal properties, but its wide use in the future is at present doubtful owing to its delayed toxic action to man.

Attempts to relate chemical constitution to insecticidal action have met with meagre success. Some of them are obviously dependent upon adsorption factors and in polar compounds on the degree of orientation of the molecules in surface layers and to phenomena of surface activity. Such are the increase in toxicity in the gaseous phase with molecular weight shown by the volatile hydrocarbons and a similar increase shown by the fatty alcohols, acids, and thiocyanates. An optimum value is reached at a definite molecular complexity. But no answer whatever is forthcoming to this question when one regards the very potent plant insecticides.

Importance of Adjuvants

Certain adjuvants, in so far as they modify wetting, spreading, and adherence have almost an importance comparable with that of the toxic substance used. Recent years have seen much attention given to methods of laboratory testing. The trend at present is to subject these methods to closer inspection with a view to improvement, and the statistician has been called in to take an active part in both laboratory and field to assess results and determine their significance. The compatability of the ingredients of combined sprays will need careful scrutiny as the tendency to use them increases. The machinery used for the application of sprays and dust is now being more critically studied.

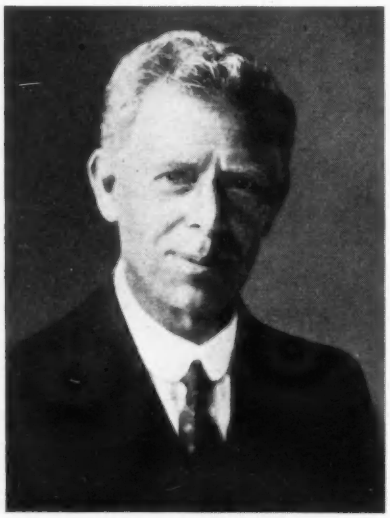
In addition to work on the control of insect pests by chemical means, other methods are always being closely investigated. The effect of radiation on insects is occupying attention, and the use of insect parasites and of cultural operations has achieved success in certain fields, nevertheless the employment of insecticides will doubtless continue to increase. There is, however, one factor, the significance of which it is not easy to forecast. Evidence has accumulated that certain scale insects on citrus have become highly resistant to the toxic effects of hydrocyanic acid gas. There is some evidence to show that the increase in resistance is not specific but applies to other insecticides as well. A prospect of this kind obviously needs careful watching.

CROP PRODUCTION

By
SIR E. J. RUSSELL, O.B.E., D.Sc., F.R.S.

BRITISH agriculture began as a very ancient three-course rotation—winter corn, spring corn, fallow. It had the great advantage of permanence; it survived in England for at least a thousand years, and there is no evidence that it would ever have failed. During the 17th and 18th centuries the system was expanded by the introduction of crops and practices developed in the Low Countries, and so there grew up the complex systems of rotation and cropping sequences now adopted on good modern farms.

Two changes were highly important. A crop of turnips, valuable for cattle, was inserted between the winter and the spring corn, and the old spontaneous vegetation of the fallow was replaced by clover, which grew vigorously and furnished food for the animals and enriched the soils. Much more animal food was thus produced and a greater number of animals could be kept: this not only increased the production of human food, but it enriched the soil by increasing the quantity of farmyard manure available. The system was still further improved after Lawes, at Rothamsted, introduced the use of artificial fertilisers. The 19th century thought in terms of ascending spirals.



Sir E. John Russell.

Like its predecessor, this rotation system was permanent, and if only we could have retained it we should have been free from many of the modern difficulties. It had, however, one fatal weakness; it required a supply of competent labour willing to accept as remuneration the equivalent of about 4 bushels (250 lb.) of wheat per week, and as soon as wages got beyond that point it became uneconomic. The history of agriculture in our generation is one long struggle to overcome the difficulties that have arisen in consequence.

Development of New Crops

Three general methods have been tried.

(1) *Development of new crops.*—Perhaps the most important change in this direction in Great Britain has taken place in recent years; it has been the marked extension in the production of milk, fruit, vegetables, poultry, and eggs, all of them of great importance in the nutrition of the nation. There has been a great extension also in the area under so-called technical crops which represent the starting point in factory manufactures notably in England, sugar beet; elsewhere, fibre crops, etc.; these yield a higher gross return per acre than the food crops and so permit of higher rates of wages.

(2) *Mechanisation.*—Labour-saving machinery is used as fully as possible so as to increase the efficiency of the surviving workers and provide better wages for them.

(3) *More grass land.*—In Great Britain, the farmer's favourite method of meeting financial trouble has been to lay the land down to grass. Grass is the cheapest of all crops to manage; even if entirely neglected it may still give some return. But it is also one of the most responsive of crops, and under proper management can become very productive. Grassland rarely, however, gives as much food per acre as arable land, nor does it require so many men, and if one were thinking solely in terms of national wealth or employment, preference would be given to arable farming.

From the point of view of soil fertility, grass is one of the best crops. It conserves the stores of organic matter and of nitrogen in the soil, and it gradually builds up a good soil structure. When finally the land is ploughed, this stored-up fertility permits of good yields of arable crops. They are not always obtained, however, because in addition to the accumulation of fertility there has also been an accumulation of insect pests which may completely destroy the young crop. So far no satisfactory insecticide has been produced for use in the soil.

In Great Britain grass is the most conservative of all our crops, but in regions of lower rainfall or of long dry seasons, where its recuperative power is less, it is liable to be over-grazed, and then soil erosion may set in.

In Great Britain there is no spectacular loss of soil by erosion; nevertheless it is periodically stated that our soils are becoming worn out. I can, however, find no evidence of deterioration of soils in this country. There are three ways in which soils might become exhausted in this country: by loss of plant food, of lime, or of organic matter. Exhaustion of supplies of plant food is so slow a process that it could not in any reasonable time lead to serious soil deterioration.

More serious deterioration results from the loss of lime. There is always some washing out of calcium in the drainage water, just as there is of most other rock constitutions, and with proper care to add periodical dressings of lime there is no danger of injury. But in regions of greater rainfall and lower temperature than those usually cultivated, especially in regions of coniferous forest, the drainage water is made acid through the decaying vegetation and the loss of calcium may become considerable. Beyond a certain stage the clay loses so much calcium that it becomes unstable; silica, iron oxide, and alumina are washed out, and carried down in the percolating water. Ultimately the soil becomes divided into layers; the uppermost one is the decaying vegetation; below is the layer out of which the soluble material is leached; and below that again a layer in which the soluble material has been deposited. The process is called podzolisation; it makes the soil very infertile. The remedies are to mix up the separate layers so that all the soil constituents come together once more, to supply lime in sufficient quantity to re-establish the proper preponderance of calcium cations in the clay and humus complexes, then to grow grass and clover so as to make the proper soil structure.

Destruction of Soil Fertility

There has been much discussion as to the extent to which soil fertility can be destroyed in moist temperate regions simply by allowing the organic matter of the soil to become exhausted. Can you destroy soil fertility by continued use of artificial fertilisers and continued withholding of farmyard manure or other organic manure? The Rothamsted experiments with wheat and barley show that the rate of deterioration of yield is not appreciably greater on the plots liberally supplied with fertiliser than on the plot receiving farmyard manure, but the supplies have to be greater than those given in ordinary practice. On the other hand it seems difficult to attain high yields of potatoes or of sugar beet without farmyard manure. But this, like the question of fertilisers for these crops, may be a matter of giving or withholding a beneficial treatment to the crop, rather than of maintaining or exhausting the fertility of the soil.

For long it was supposed that the 10 classical elements of

plant nutrition were all that were important. Four others are now known to be necessary, though only in very small quantities: boron, manganese, copper and zinc. Unless the plant can obtain them it suffers certain physiological disturbances which have been recognised as obscure diseases and for which the remedy is now obvious. Other elements, cobalt, molybdenum, selenium, fluorine, and iodine in appropriate quantities considerably influence the nutritive value of the crop to animals.

One of the oldest problems in agricultural chemistry is to find some chemical method of estimating the amounts of plant food in the soil so that fertiliser recipes could be based on exact analysis. Unfortunately the problem has proved too complex to permit of any general solution. The problem is under re-examination at Rothamsted; meanwhile the only safe basis is field experiments; and for this improved methods are also being worked out at Rothamsted.

Quality Determined by Water Supply

A great amount of experimental work has shown that quality is determined largely by the water supply and temperature conditions under which the crop is grown, and to a much less extent by the food supply. This is rather unfortunate, since water supply and temperature are less under control than food supply, being determined by the climate and soil type, neither of which can be much altered by the agriculturist. But there is the advantage that, where the conditions allow good quality to be obtained, proper manuring may considerably increase the yield without much affecting the quality one way or another.

Where experimental tests are difficult there is always scope for opinion, and in no subject are opinions more freely expressed than in dietetics. A considerable number of people on the Continent and in this country hold firmly to the belief that the nutritive value of crops is profoundly affected by other conditions of growth in addition to those set out above, that it is adversely affected by inorganic fertilisers, and benefited by organic manure and, according to many, also by certain stellar and lunar influences. Experimental examination of the latter claims is impossible because the non-terrestial "influences" are unknown and therefore incapable of elimination in the control tests. But examination of the claims that inorganic ferilisers injure the quality of crops is possible. No evidence is offered nor do I know of any. All available evidence goes to show that the large crops grown with suitable fertiliser mixtures are at least as healthy and as nutritive as any others.

Organic manures have undoubted value, and all their actions are probably not yet known. The inorganic sources, nitrate of soda and sulphate of ammonia, are about twice as effective as farmyard manure per unit of added nitrogen in supplying nitrogen to crops. Farmyard manure has, however, valuable physical effects on the soil which render it almost indispensable for crops like vegetables and potatoes that require a good deal of cultivation; it is less necessary for cereals that do not. The falling off in supplies of farmyard manure has raised again the old problem of substitutes; town refuse is promising especially if the non-manurial substances, paper, glass, metals, coal, and cinders, could first be removed; sewage sludge is also good if it contains more than 3 per cent. of nitrogen, otherwise its value depends mainly on its lime content. Straw composts made by the Adco or similar methods are useful for the amateur and the market gardener; other vegetable wastes can be composted also. But there is no evidence that the reduced production of farmyard manure has lowered that fertility of British soils; there has been a corresponding shrinkage in the area of arable land, and the grass land into which the arable has been transformed does not need farmyard manure.

FUNGICIDES

By
HUBERT MARTIN, A.R.C.S., F.I.C.

THE purpose of the agriculturist is not to produce crops on which neither disease nor pest can thrive in localities and seasons where such crops are easy to grow. His aim is to produce crops meeting public demand at the time and spot yielding him the greatest return. Profit drives the grower and economic factors must govern the recommendations of the plant pathologist. Economic reasons alone are enough to ensure the survival and development of fungicides and, despite somewhat crude methods, the principles underlying their use are as rational and as scientific as the use of antiseptics in surgery.

At first sight the present methods of the application of fungicides appear certain to fail, for it seems most improbable that a dilute suspension of a chemical scattered over the dense foliage of a potato crop in July could serve to prevent or even delay infection by *Phytophthora infestans*, or that the churning of seed barley with talc dust containing a small percentage of an organo-mercury derivative would prevent infection of the barley seedling by *Helminthosporia* spp., the mycelium of which is already within the grain. Yet in both cases the control obtained is practically complete, a success which speaks well for the prospects of fungicides when more is understood of their action and of the factors contributing to their efficiency. Up to the present but one of these factors, the time of application, has been fully studied, for this time is determined by the life history of the pathogen relative to that of the host.

In recent years, however, attention has been paid to other factors affecting the efficiency of fungicidal treatments, such as the amount of fungicide retained on the treated plant or seed. To reduce the number of spray applications which the grower has to make per season, many attempts have been made to combine, in one spray, two or more fungicidal or insecticidal constituents. Usually the two sprays, at the concentrations normally used, have been mixed, but it is now evident from retention and penetration considerations that this method will be generally unsatisfactory when both direct and protective constituents are concerned. A variety of alternatives sidestepping this retention difficulty are available. The concentration of the protectant may be increased to give an adequate spray residue in spite of excessive draining, a method not likely to prove immediately popular to growers unless the amount of spray required per acre is reduced sufficiently to cover the additional cost of the increased concentration and of the surface-active component added as penetrant and wetter. The possibilities of this method will perhaps be explored when more experience has been gained of atomisation as a method of spray application.

A second alternative already explored—for it promises results of more rapid practical application—is to dissolve the direct-acting constituent in an oil or other water-immiscible liquid of good penetrating properties and to emulsify in an aqueous phase of moderate wetting properties.

Compounding Pest Control Products

In compounding pest control products the primary purpose of the manufacturer has been to render the product fool-proof but, with greater knowledge of the physico-chemical properties making for better performance, the fool-proof character can be coupled with increased efficiency. The immediate future of pest control products is the introduction of known and established active constituents in new forms easier to use and better than the older insecticides and fungicides.

Actually the number of established active constituents of fungicides is limited to sulphur, copper, mercury, formaldehyde, and a few less widely-used materials. It is regrettable that little is as yet known of the way in which these materials exert their toxic actions, though speculations on this theme would fill a book. The impression gained by the writer is

that although potent organic fungicides have been discovered they exhibit a specificity of action which prevents their appearance in competition with products of more general fungicidal properties. Nevertheless fungicides based on synthetic organic compounds have appeared in the market, the two outstanding examples being salicylanilide originally devised for the protection of textile materials, and tetramethyl thiuram disulphide, a compound of mild fungicidal properties discovered originally in the attempt to augment the fungicidal action of sulphur by the addition of rubber accelerators. The greater part of organic chemistry still awaits exploration in the search for synthetic fungicides, but whether such derivatives will be able to compete with inexpensive copper derivatives and sulphur is uncertain.

Discussion on the Papers by Drs. Grant and Thomas

MR. WALLACE P. COHOE commented upon Dr. Thomas' mention in his paper to Dr. Farr's work on the structure of cellulose, which led to the conclusion that the particles of cellulose are held together by a pectinous cement. Mr. Cohoe said that this work explained several problems in the paper-making art. The whole question had not yet been fully investigated and the real nature of the pectinous cements had not yet been determined. Dr. Farr's findings had significance in elucidating several problems of cellulose chemistry, for instance, Dr. Farr believed that oxycellulose was in reality cellulose particles from which the cementing materials had been removed.

Discussing the conservation of cellulose supplies, MR. W. H. ROWELL said that although grasses often did not make good paper they had great possibilities in plastics by conversion into cellulose derivatives. The subject of cellulose derivatives was going ahead and improved products were being made. He cited cellulose acetobutyrate as a recent product which melted sharply and thus gave better mouldings. New cellulose esters were also being introduced for lacquer purposes. DR. R. B. FORSTER pointed out that re-afforestation took a long time and that the rate of cellulose consumption was higher than the rate of good production. Thus, other sources of cellulose had to be sought—rush seeds, grasses and bamboo. He disagreed with Mr. Rowell that grasses gave inferior paper. Turning to Mr. Thomas' paper, he asked the author whether he had experienced difficulties in drying artificial silk after it had been dyed in the cake form.

Bamboo for Textile Purposes

MR. R. W. WINTER drew attention to the large areas of bracken which were a trouble to agriculture and asked what was its cellulose content and quality of the cellulose as it might serve as a useful additional source of the material. MR. A. J. GIBSON said that the future supply of cellulose from wood was very precarious and a difficulty in re-afforestation was the long time taken for the trees to reach maturity. Bamboo, however, had the advantage that it was fully grown in three years and produced an excellent paper-making pulp. Its possibilities as a source of cellulose for textile purposes had not yet been explored and he asked to draw Dr. Grant's attention to this.

DR. W. D. SCOTT pointed out that the amount of wood wasted through the attack of micro-organisms was very considerable and if this waste could be eliminated anxiety regarding the future supply of cellulose would be greatly relieved. CAPTAIN W. H. CADMAN said that there were two uses of wood to which Mr. Grant had not referred. These were as a fuel and in the manufacture of synthetic sausage skins. He added that the petroleum industry produced the raw materials for the production of fibres of equally good properties as those obtained from cellulose. This might help in the future to offset the increasing demands for cellulose.

In reply, DR. JULIUS GRANT said that he was interested in Mr. Gibson's experience with bamboo cellulose. There was ample scope for growing bamboo in the Empire and practical arrangements might be made for its export as such or in pulp form. He regretted that he was unable to give any information on the cellulose content of bracken. The whole question of re-afforestation was a debatable one and, in his opinion, it was mainly a matter of making up for the time lag in the growing of timber. DR. H. A. THOMAS, in reply to Dr. Forster, said that difficulty had been experienced in drying rayon cakes after dyeing, migration of colour occurred and streaky effects arose. The trouble had been largely overcome by mechanical methods.

Discussion on the Paper by Mr. Redgrove

AMONG the many contributions to the discussion following Mr. Redgrove's presentation of his paper, DR. W. CULLEN, referring to Mr. Redgrove's remarks on the increasing use of titanium dioxide in face powders, said that as far as he knew there was only one source of the compound in the world. It was largely used in paints among other purposes, and thus there might be future difficulties in supply. DR. R. B. FORSTER said that the author had made no reference to the use of cocoanut oil in cosmetics. He said that owing its low molecular weight this oil was absorbed more easily by the skin than any other oil. DR. H. A. THOMAS said that it had been found in the rayon industry that titanium dioxide accelerated the fading in light of some dyestuffs. This was perhaps a point to be watched in using it in coloured face powders.

In reply, MR. H. S. REDGROVE said that titanium dioxide was only used to the extent of 1 to 10 per cent. in face powders and the bulk required was so small that it would contribute little to any danger of exhausting the supply. He added that the danger of it fading the colours of face powders was not serious as these were always stored in the dark. He said that cocoanut oil used to be employed in cosmetics, but it was found to be irritating to some skins. Turtle oil and avocado pear oil were two of the most modern oils used, they were non-irritating and easily absorbed.

Articles of Almost Pure Silica

New Method of Manufacture

A NEW method for making articles of (almost pure) silica, which has been developed by the Corning Glass Works, is described in the current number of *Glass Industry*.

The process consists in making an article in the desired final form (*e.g.*, a beaker, funnel, dish, etc.) from a borosilicate composition which is somewhat unstable, and on heating breaks up into a two-phase system, one silica-rich, the other silica free, or practically so. This latter phase is leached out with dilute acid, preferably nitric. This leaves a skeleton of the high silica phase, which contains 96 per cent. SiO_2; the amount of material removed by leaching is about 36 per cent. of the initial weight of the object. The skeleton of silica is finally shrunk to a homogeneous transparent body by heating at the softening point.

This form of silica has very nearly the mechanical properties of ordinary fused silica, and is vastly better than the best quality low expansion glass. Thus the coefficient of expansion (linear) is 7.8-8, 10^{-7}, the corresponding figures for silica and low expansion glass being 5.85 and $32\text{-}33.10^{-7}$ respectively. The softening point is 1,442° C. (fused quartz 1,667°, *i.e.*, glass 819°) whilst the maximum working temperature is 900°-1,000°, as against 1,100 for quartz and 500-600 for glass.

Articles made from this form of silica have the same resistance to thermal shock as silica (e.g., they can be quenched in ice-water when red-hot, without fracture), and because the method of manufacture is susceptible to mass production methods, they should be much cheaper than those made of fused quartz. Commercial production is not envisaged earlier than two years hence.

Anglo-Swedish Trade Talks

Chemical Plant and Chemicals Discussed

AMONG the points discussed by the various industrial groups during the recent Anglo-Swedish trade talks held under the auspices of the F.B.I. were those concerning chemical plant, chemicals and paints and varnishes.

It was stated that the Swedish chemical industry obtained much of its plant from the continent and that British suppliers of plant should improve their contacts with Swedish users. Frequent visits by British representatives were suggested, and also the regular mailing of up-to-date catalogues and frequent advertising in Swedish technical journals. Swedish agents, it was suggested, should be employed in preference to the common practice of an all-Scandinavian agency. The question of price was raised, and the importance of a better delivery for export orders. The Swedish Chemical Association and Import Bureau of the Swedish Export Association offered full co-operation in placing British suppliers in touch with chemical manufacturers.

There were some very useful discussions concerning chemicals. One point was that although cartels did exist for a few chemicals, there was a big field which was not covered by cartels. Even where cartels operated, they were much more flexible, it was stated, than the Swedes imagined. There appeared to be in Sweden the feeling that this country was not in a position to supply chemicals, but that point had been definitely cleared up.

Among the paint and varnish products discussed were: Cellulose lacquers and synthetic enamels, products for use on food containers, coloured cements, paints for the retail trade, dry colours and high class varnishes. British colour makers urged that greater consideration should be given to quality rather than price, and a member of the Swedish delegation said he would represent this case as strongly as possible to the members of his Association in Sweden. He also accepted an offer of a set of British Standard Specifications for pigments and would consider recommending his members to buy pigments conforming to those standards.

The outstanding fact emerging from the talks is the vital importance attached by the Swedish delegates to the visits to Sweden of the principals of British firms or of their technical advisers to study at first hand the special needs of their Swedish customers.

EVACUATION OF GROUND-COAT ENAMELS

THE effect of evacuation prior to firing on the properties of ground-coat enamels has been studied by Stone and Amero (*Bull Amer. Ceram. Soc., 18,* 1939, 200-202).

A ground-coat slip made up of equal quantities of hard and soft frit, was milled in an ordinary ball-mill under atmospheric and reduced pressures. No effect of evacuation was observed until a vacuum of 28 in. of mercury was reached. The slip evacuated under this pressure aged much more rapidly than that ground at atmospheric pressure, reaching a constant dip-weight after 36 hours, against 84 for the latter, this being considered to be produced by the elimination of the air film around the individual particles, which increases the surface exposed to solution action and so accelerates the attention of equilibrium. The slips thus obtained were fired on 18 gauge sheet iron at 1,640° F. for two minutes. The properties of the fired enamel were identical in all respects except that of adherence, in which the evacuated slip was very much better. (Here again a vacuum of 28 in. was essential to obtain any improvement). A slip which had been standing for a month, evacuated just before dipping, gave a fired enamel of 14 per cent. better adherence than when applied unevacuated. This suggests an important use for evacuation in reclaiming slips which have become useless through loss of set. Evacuated slips also have a higher dip weight and drain somewhat less, enabling a greater degree of covering to be obtained.

Chemical Matters in Parliament

Oil from Coal Plant

In the House of Commons this week Mr. Tinker asked the Secretary for Mines whether, in the setting up of new works, there was a likelihood of an oil-from-coal plant being placed in Lancashire where there were available sites and the full supply of fuel.

Mr. Lloyd replied that the question of the erection of oil-from-coal plants was a matter for commercial initiative; but he had no doubt that where the establishment of such plants was contemplated the points mentioned in favour of Lancashire would not be overlooked.

Chemical and Metallurgical Industries

Mr. Ellis Smith asked the President of the Board of Trade, (1) whether he was aware that it was now possible to generate electric current at a cost which compared favourably with most water-power countries, and thus to introduce or expand many industries; and, seeing that with the latest developments all the electro-metallurgical and subsidiary chemical processes should be centralised around large-scale power plants, and in view of the urgent need to marshall the full resources of the country, would he indicate what action he proposed to take;

(2) whether he was aware of the need to develop the electro-metallurgical and electro-chemical industries; would he take action to deal with the problems involved in view of their basic national importance; and would such action be taken at once having regard to the economic and other factors, the need to stimulate the depressed coil mining areas and develop the electrolytic processes and the production of ferro-silicon, molybdenum, titanium, and ferro-vanadium;

(3) whether he would arrange for an early meeting of the Imperial Economic Committee, the Electricity Commissioners, and the Import Duties Advisory Committee, in order to consider the need for immediate action in order to bring the country into the position it should be in view of recent developments in the electro-chemical industries with particular regard to our needs in calcium-carbide, ferro-alloys, copper refining, and the production of aluminium and magnesium, and, also, the need for several national modern steam-power plants, planned and erected and linked up on the same site, the production of by-products and synthetic-organic plants.

Mr. Oliver Stanley, in answer, said that he was aware that recent developments in the production of electricity in this country had tended to reduce the advantage of water power over steam power, with the result that the advantage of the former for the production of various materials was diminishing. A wide range of materials was already produced in this country in the electric furnace or by electrolytic processes, and he understood that other projects were in contemplation. The interests concerned in this country were in close touch with new developments.

Petroleum (Production) Acts

Mr. G. Macdonald asked the Secretary for Mines what progress had been made as a result of the Petroleum (Production) Acts, 1934 and 1935; the number of licences issued, with the areas concerned; and whether any prospecting had resulted satisfactorily?

Mr. Lloyd replied that since the issue towards the end of 1935 of the first licences under the Petroleum (Production) Act, 1934, the work of prospecting for oil in this country had been actively proceeding. A total of 98 prospecting licences had been issued, and 77 of these, covering an area of 11,800 square miles, were in force. In all, 16 deep test boreholes had been put down and three more were being drilled. As to the results of this prospecting, oil and natural gas had been encountered in boreholes near Edinburgh, and natural gas in a borehole near Whitby. Recently oil had been encountered in a deep borehole at Eakring, Nottinghamshire, and also smaller quantities at a shallower depth near Formby, Lancashire.

Recent Trade Literature

THE DRAYTON REGULATOR AND INSTRUMENT CO., LTD., have issued a leaflet dealing with tank regulators and steam traps. Descriptions are given of the V.T. automatic temperature regulator which controls the temperatures of hot water supply tanks and calorifiers, process baths, vats and other vessels containing a liquid heated by direct steam injection, steam coils or hot water, the Drayton/Armstrong inverted bucket steam trap and the "Drico" trap for low pressure steam heating.

The present year marks an important milestone in the history of WALLACH BROS., LTD., as it is exactly fifty years since they commenced business in their original premises in Gracechurch Street, London. It is fitting therefore that the latest edition of their "Blue Book of Safety Appliances" should be such a comprehensive and interesting publication. For the first time the "Blue Book" has been issued in four different sections. Sections one and two are devoted to general industrial safety equipment, while section three deals with "Evertrusty" air raid precautions equipment. Section four is confined to "Evertrusty" industrial gas masks and breathing apparatus.

Highly accurate measurements of temperatures from those in the neighbourhood of absolute zero up to about 500 C. are being made on the new Mueller resistance thermometer bridge according to a folder issued by the LEEDS AND NORTHUP CO., Philadelphia, manufacturers of the instrument. Measuring from 0 to 111.111 ohms in steps of 0.0001 ohm, it is claimed to establish a new level of accuracy for commercially available temperature measuring equipments in this range. Achieving this high accuracy by virtue of a constant-temperature chamber for the measuring resistors, the new bridge also has many other distinctive features fully described in the folder (E-33C(1).

One of the most effective "salesmen" of British industry is the *F.B.I. Register of British Manufacturers*, the nineteenth edition of which has now been published and more than 200,000 copies of which have been distributed since its inception to buyers and merchants in every part of the world. In this authoritative survey of British industry, more than 5,000 products, ranging from biscuits to battleships (and including under each head the names of manufacturers), occupy nearly 400 pages. No fewer than 180 pages are taken up by the names and addresses of firms covering every branch of industrial production, and other sections of the Register record trade names and well-known trade marks. The edition has an attractively produced supplement "About Britain," an article which gives practical advice on the best factory sites for various types of products. The edition is priced at 15s. post free (Overseas 10s.).

"A CENTURY of Fertiliser Progress," by E. H. Tripp and S. W. Cheveley, which was published on the occasion of the Royal Agricultural Society's Centenary Show which opened at Windsor on July 4, is the result of a great deal of research into the history of commercial fertiliser production. In view of the fact that the centenaries of the Society and of commercial fertiliser production coincide, the I.C.I., Ltd., stand at the Show illustrated the theme of the book and described how the British fertiliser industry won, lost, and retrieved its supremacy. The outstanding events of the cradle days of fertilisers are presented in a simple manner. It is shown how certain fertilisers which to-day are regarded as essentials, e.g., basic slag and potash, were for years cast aside as useless materials, and but for the investigations of these early agricultural scientists their value might even to-day have remained unrealised. There is ample evidence of thorough historical research, and the material gathered together has not hitherto been available in this form. There are many illustrations and altogether it is a most readable book for farmers or for students.

PERSONAL NOTES

MR. GEORGE H. FERGUSON has been appointed general manager of the Scottish branches of Frederick Braby and Co., Ltd. MR. JAMES P. MACKINNON has been appointed assistant manager.

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MR. DOUGLAS W. DAVISON, who was previously in the service of the Dunfermline Corporation Gas Department, has been appointed chief technical assistant to the Aberdeen Corporation Gas Department.

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MR. ERIC SHIEL, manager of Thurso Gasworks, has been appointed manager of Innerleithen Gas Co. in succession to his father, Mr. James Shiel, who has been manager at Innerleithen for the past 33 years, and who is retiring.

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MR. WILLIAM OGILVIE, works manager at the Roslin explosive works of Nobel's, retired recently. He joined Midlothian Gunpowder Co., Ltd., West Calder, in 1895, and has been connected with the blackpowder industry ever since. He was appointed works manager to Curtis's and Harvey, Ltd. (now Nobel's Explosives Co., Ltd.) explosives works, Roslin, in 1928.

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MR. MORRIS E. LEEDS, founder and president of the Leeds and Northrup Company, Philadelphia, is assuming the position of chairman of the board of directors, and Mr. Charles S. Redding, vice-president in charge of research and engineering, becomes president. Chairman of the board is a post newly created to facilitate Mr. Leeds' participation in policy matters. In 1899 Mr. Leeds started his own business, providing an American source of "null" or balance-type electrical measuring instruments—resistors, condensers, galvanometers, inductors, etc. He then proceeded to the pioneering development of the automaticaly-operated balance-type instrument which would not only measure, but would also record, signal and control. Some years later, in 1920, he was awarded the Edward Longstreth Medal of Merit of the Franklin Institute for this invention.

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THE Advisory Committee for Leverhulme Research Fellowships have recomended, and the Trustees have approved, awards tenable for varying periods up to two years. Among these are :—

W. CULE DAVIES, D.Sc., Ph.D., Lecturer in Chemistry, University College, Cardiff, Leverhulme Research Fellow.—Studies of the organic compounds of nitrogen, phosphorus and arsenic.

B. JONES, B.Sc., Ph.D., Lecturer in Chemistry, University of Sheffield.—A study of reaction kinetics in solution.

E. B. MAXTED, D.Sc., Ph.D., Special Lecturer in Catalysis, University of Bristol.—Studies in catalyst poisoning.

D. A. O'DUFFY, B.Sc., Research and Development Assistant, Bahrein Petroleum Company, Leverhulme Research Fellow.—Lubrication problems at high temperatures and pressures.

W. A. WATERS, M.A., Ph.D., Lecturer in Chemistry, University of Durham.—Mechanisms of reactions involving free organic radicals.

OBITUARY

MR. WILLIAM BOYD ANDERSON, a director of the Glasgow firm of Thomas Macintyre and Co., Ltd., paint manufacturers, died recently.

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MR. C. W. PENNELL, a former Mayor of Lincoln, and a director of the Lindsey and Kesteven Chemical Manure Co., Ltd., has died at the age of 77.

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MR. THEODORE L. WENGER, a director of Wengers, Ltd., chemical dyers, Etruria, Stoke-on-Trent, has died in Melbourne. He went to Australia at the end of last year on a business trip, and has been ill since January.

General News——From Week to Week

A NEW FACTORY is to be erected for Ranton and Co., Ltd., bakelite moulders, at Brentford, Middlesex.

THE WORKS of Howards and Sons, Ltd., Ilford, will be closed for eight days for the annual holiday from July 29 to August 8.

MESSRS. ALBERT L. MOND AND THIEMANN, chartered patent agents, and chemical engineers, have moved to new premises at 14-18 Holborn, London, E.C.1. (Telephone: Holborn 6074-5).

THE STAFF of Thomas Hill-Jones, Ltd., manufacturing chemists, took part in their annual outing on July 8, when a visit was paid to Southend. Mr. W. S. Lloyd-Willey, director, took an active part in the general arrangements.

ACCORDING to a statement in the "Supplement to the British Medical Journal," the B.M.A. Council intend to approach the Poisons Board with the object of having the drug M. and B. 693 placed on the poisons list.

IT IS REPORTED that about 200 employees of Nobel's explosives factory at Linlithgow, will be discharged after the factory holiday on July 22 owing to a reduction in output. There are 600 men employed in the factory.

THORNTON-CLEVELEYS URBAN DISTRICT COUNCIL has given contracts to Humphreys and Glasgow, Ltd., London, S.W., for the supplying and erecting of a water-gas plant at the gas-works, and to W. C. Holmes, Ltd., Huddersfield, for the supplying and erecting of a crude benzole plant.

THE REPORT of the Coal Utilisation Council for the year ended March last stated that, whereas in 1936 the amount of pulverised fuel used for central heating boilers was returned at 200 tons, and in 1937 at 1,200 tons, consumption reached 2,000 tons in 1938. The total consumption of pulverised coal in 1937 was 6,101,180 tons, compared with 2,755,158 tons in 1929. In 1920 it took 44.37 hundredweight of coal to produce a ton of pig iron, and the figure has now been reduced to 33.89 cwt.

IN THE COURSE of the revision of series of British Standards for pigments for paints, it was felt that there was a need for a standard to provide for chemically-prepared hydrated oxides of iron which are now being increasingly used. B.S. 851, which has now been issued to meet this need, provides for Marigold, Maroon and Yellow pigments of the pure and reduced type. The form of the specification follows that of the other British Standards for pigments and includes requirements relating to composition, coarse particles, oil absorption, colour, staining power, volatile matter, matter soluble in water and carbonates. Standard methods of testing to determine these requirements are given in appendices. Copies of the Standard may be obtained from the British Standards Institution, Publications Department, 28 Victoria Street, London, S.W.1, price 2s. (2s. 2d. post free.)

THE 31ST ANNUAL AUTUMN MEETING of the Institute of Metals, will be held in Glasgow from September 5-8, 1939. The meeting is being arranged by the Scottish Local Section with the co-operation of the civic and technical authorities in Glasgow and the principal Scottish industrialists. Members will be welcomed at the conference headquarters—the Institution of Engineers and Shipbuilders—on the evening of Tuesday, September 5, by the Lord Provost of Glasgow, the chairman of Governors of the Royal Technical College, and the President of the Glasgow Chamber of Commerce, and after a short business meeting Mr. W. Murray Morrison, F.Inst.Met., will deliver the 17th Autumn Lecture on "Aluminium and Highland Water Power." The following papers will be presented for discussion during the meeting: Donaldson: "The Thermal Conductivity of Some Industrial Alloys of Copper and Nickel"; Cuthbertson: "The Anodic Oxidation of Aluminium"; Vernon, Akeroyd and Stroud: "The Direct Oxidation of Zinc"; Price and Thomas: "The Production of Tarnish-Resistance by the Electrolytic Deposition of Beryllia, with Special Reference to Silver"; Northcott and Thomas: "Dendritic Structures. Part I: The Influence of Crystal Orientation"; Smith and Watson: "A Contribution to the Study of Segregation in Copper-Silver Alloys"; Haughton and Tate: "Alloys of Magnesium. Part VIII: A Further Study of the Mechanical Properties of Some Wrought Alloys."

AT A MEETING of the British Medical Association, to be held at Aberdeen, on July 26, the use of the sulphanilamide group drugs will be among the points discussed.

THE BRITISH PLASTICS FEDERATION, LTD., has changed its address from to-day (Saturday) from 1-3 St. Paul's Churchyard, London, E.C.4, to 11-12 Pall Mall, London, S.W.1. (Telephone number: Abbey 6863).

THE NEW COKE OVENS erected at the Clyde Iron Works extension of Colvilles, Ltd., have successfully turned out their first few charges of metallurgical coke. The full double battery is not yet complete, but it is planned to have the entire scheme ready in time to supply the second 500-ton a day blast furnace now under construction. This will be completed at the end of this year or early next year.

View of some of the guests who attended the garden party given by Lord and Lady Leverhulme at Reed Hall, Exeter, to members of the Society of Chemical Industry.

SIR JAMES PRICE, the newly appointed Commissioner for the Special Areas, inspected the Team Valley Trading Estate on July 7. "What I have seen during my short visit," said Sir James, "has impressed me. I can see now that Team Valley Trading Estate is all that it has claimed itself to be, and in my opinion it should continue to succeed in its purpose of attracting more light industries to the North-East."

ATTRACTED by the presence of a thick gas coal reputed to yield 40 gallons of oil per ton, the Coal Oil Development Co., of London, is erecting an oil distillation plant at Afton Pit, New Cumnock, Ayrshire, belonging to New Cumnock Collieries, Ltd. The pilot plant will deal with 50 tons a day, but it is hoped to increase this eventually to 300 tons or more. The process used will be the Freeman, in which the distillation and "cracking" of the products are carried simultaneously in one retort.

A NEW BRITISH STANDARD SPECIFICATION, No. 840, light-gauge copper or copper-alloy conduit and fittings for electrical wiring, has recently been issued. It prescribes the quality of the copper or copper-alloy from which the conduit should be made, and gives details of manufacture and tests. A table has been included giving a comparison of the inside and outside dimensions of copper conduit as against those for steel conduit covered by B.S. 31. Copies of this new British Standard (No. 840-1939) may be had from the British Standards Institution, 28 Victoria Street, London, S.W.1, price 2s. 2d. post free.

THE JOINT SUB-COMMITTEE on special cements of the Institution of Civil Engineers and the British Committee on Large Dams have had under consideration the properties desirable in cements to be used for mass concrete subjected to water pressure on one side. Arrangements were made for an investigation to be carried out at the Building Research Station on methods for comparing the relative resistance of cements to leaching when soft waters percolate through concrete. The results of the investigations are now issued by the Department of Scientific and Industrial Research as Building Research Technical Paper No. 26 entitled "The Solubility of Cements. (H.M. Stationery Office, 6d. net.).

AUSTRALIAN ESSENTIAL OILS, LTD., Pitt Street, Sydney, N.S.W., have appointed Messrs. W. Balchin, 79 Mark Lane, London, as their sole agents in the U.K. for their "Ti-trol" antiseptic oil.

ACCORDING to a statement made by Mr. Elliot, the Minister of Health, in the House of Commons last week the plan to build steelworks at Edale, Derbyshire, put forward some months ago by Brown, Bayley, and Co., Ltd., Sheffield, has been abandoned. Numerous protests were made against the proposal and as a result the directors promised to consider alternative sites.

THE INTERNATIONAL SOCIETY OF LEATHER TRADES' CHEMISTS and International Verein Der Leder-Industrie Chemiker will hold a joint conference in London from August 27 to September 1. Following a reception at the Mayfair Hotel, W.1, on Sunday, August 27, the Conference will open at Regent Street Polytechnic (Portland Hall Annexe) on August 28, when the First Procter Memorial Lecture will be delivered by Dr. W. T. Astbury on "The Molecular Structure of the Fibres of the Collagen Group." The Presidential Address will be given on August 29 by Mr. W. R. Atkins on "The Procter-Wilson Theory of Protein Swelling in the Light of Modern Ideas of Protein Structure." On the same day the official reception by the Lord Mayor of London will take place at the Guildhall. The official banquet will be at the Park Lane Hotel, Piccadilly, on the evening of August 30, and the Conference will close on the following day. On September 1 delegates will participate in a motor coach tour.

Foreign News

MAINLY BECAUSE of the unsatisfactory position of the local sugar industry—importation of fertilisers into the Philippines during 1938 declined to 36,481 metric tons, from 54,969 in 1937.

ACCORDING to the Tariff Commission production of synthetic resins in the United States during 1938 totalled 130,358,652 pounds compared with 163,030,410 in 1937. The decline in synthetic resins was in those of coal-tar origin, while non-coal tar resins increased.

SPAIN, which for many years has been a large importer of nitrogenous fertilisers, is unofficially reported to be considering the development of a State fertiliser industry. Calcium nitrate production at the rate of 30,000 to 40,000 tons annually has been proposed for a plant to be constructed at Valladolid.

A SYNTHETIC TANNING AGENT known as Lignogal AN is being put on the Polish market by the Lignoza Company of Kattowitz.

TWO MONOGRAPHS on Poland have been issued by Birmingham Information Service on Slavonic Countries. Monograph No. 4 deals with the national income of Poland and basic statistics, and No. 5 with Poland's foreign trade.

IT IS REPORTED from the office of the American Commercial Attache, Paris, that a syndicate of manufacturers of and dealers in casein has recently been established in France to represent and protect the general interests of the French casein industry.

DR. D. A. BRYN DAVIES, of the Geological Survey of British Guiana, has discovered in that country, several deposits of manganese. One of the deposits is believed to be of importance commercially. They are described by Dr. Davies in the Bulletin of the Imperial Institute (July issue).

PLANS ARE CONTEMPLATED for utilising the vine wood accumulated during the trimming of French vines as a source of charcoal for use as a petrol substitute in motor cars. The estimated annual production of charcoal from this source is over 120,000 tons.

A PLANT FOR CALCIUM CARBIDE PRODUCTION is now under construction by the Electro Zuur-en Waterstofffabriek N.V. which will be able to meet the entire Dutch demand while leaving a certain surplus for export. The concern also proposes to manufacture chemicals from carbide.

THE CEMENSTONE CORPORATION of Pittsburgh has established an industrial fellowship in the Mellon Institute, Pittsburgh University, for conducting fundamental chemical and physical research on precast concrete units. The main objective of the investigational project will be to develop novel practical methods and techniques that will be of wide applicability in the production of precast concrete. Mr. Donald R. MacPherson has been appointed to the incumbency of this fellowship.

AN UNUSUALLY EFFICIENT DESIGN of laboratory rectifying column described in the *Chemische Fabrik* (5th July, 1939) by Dr. E. Jantzen and Dr. W. Haker is stated to be capable of separating mixtures of liquids of close boiling points with exceptional sharpness. It has proved of great value in the separation of coal tar distillates. Thus a xylene fraction containing ethyl benzene (b.p. 136.25), p-xylene (b.p. 138.46), m-xylene (b.p.139.2), and o-xylene (b.p.144.49) yielded practically pure ethyl benzene and o-xylene after only one distillation, while m-xylene in 98 per cent. purity was isolated after two distillations.

Chemical and Allied Stocks and Shares

SENTIMENT on the Stock Exchange has continued to be governed by the uncertainties of international affairs, and the trend in share values has been moderately reactionary, mainly owing to the absence of demand. Markets have again been unresponsive to the many indications that industrial activity is being accelerated as a result of armament and other Government work.

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Most shares of companies identified with the chemical and allied trades were only moderately lower and various steady features were shown. B. Laporte were less active, but at 58s., were virtually the same as a week ago, as were Fison Packard at 40s. 6d. Imperial Chemical were 28s. 6d., compared with 28s. 10½d. a week ago and the preference units were maintained at 29s. Distillers remained under the influence of the dividend and scrip bonus, and at 94s. 9d. are virtually unchanged on balance. Borax Consolidated were unchanged at 19s. 9d., while Lawes Chemical 10s. shares were again quoted at 7s. 6d. The shares of the last-named company do not often change hands actively; last year their dividend was 6 per cent. Lever and Unilever have been lowerd to 33s. 3d., and British Oil and Cake Mills preferred ordinary units were 9d. down at 40s. 3d. Low Temperature Carbonisation 2s. units declined to 1s. 4½d. on the decision not to pay a dividend.

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Imperial Smelting had a firmer appearance at 9s. 6d. on the view that the trend in the price of zinc is likely to be upwards during the next few months. General Refractories were steadier around 7s. 4½d. in the belief that demand for the company's products is improving owing to the increased activity in the iron and steel industries which are its most important customers. On the other hand, the market is not expecting that the shares will show an early return to the dividend list. British Glues 4s. ordinary shares remained steady at 4s. 9d. Blythe Colour Works were unchanged at 7s. 6d., awaiting declaration of the interim dividend, while William Blythe 3s. shares were again quoted at 6s. Reckitt and Sons' ordinary improved 1s. 3d. to 100s.

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In other directions some demand was reported for British Plaster Board, which improved to 29s. 3d., attention being drawn to the reference to a forthcoming bonus made at the recent meeting. Associated Cement were around 65s. and in common with other leading cement shares tended to move fairly closely with the day-to-day trends of the Stock Exchange, as did Turner and Newall, British Oxygen, Murex, British Aluminium and other widely-held shares. Pinchin Johnson were slightly better at 22s., and International Paint remained around 80s., while Wall Paper Manufacturers deferred units were again 25s. 6d. Barry and Staines improved to 32s. 6d. and Michael Nairn were steady at 55s. 7½d. United Molasses were steadier around 23s. 9d. Iron and steel securities were unresponsive to the good steel and pig iron output figures for the past month, sentiment being overshadowed by the prevailing tendency on the Stock Exchange. Dorman Long, Guest Keen, Consett Iron and Stanton Iron, however, had a steadier appearance.

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Boots Drug were firm and slightly higher at 40s. 6d., while British Drug Houses were again 21s. 3d., and Sangers kept at 20s. 3d., the last named having been assisted by the good impression created by the statements at the recent meeting. Timothy Whites and Taylors at 22s. 1½d. were unchanged on balance. Beechams Pills deferred shares at 8s. 10½d. were also the same as a week ago. "Shell," Anglo-Iranian and other oil shares were lower on balance in sympathy with the surrounding tendency in the stock and share markets.

Inventions in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of Specifications accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

Applications for Patents

PREPARATION OF AMMONIUM NITRATE, ETC.—Hydro Nitro Soc. Anon., and T. Hobler. (Poland, June 27, '38.) 17868.

MANUFACTURE OF BENZANTHRONES.—I. G. Farbenindustrie. (Germany, June 18, '38.) 17498.

PRODUCTION OF HYDROXYLAMINE SALTS.—I. G. Farbenindustrie. (Germany, July 29, '38.) 17889.

PREPARATION OF THERAPEUTICALLY USEFUL HETEROCYCLIC COMPOUNDS.—May and Baker, Ltd., A. J. Ewins and M. A. Phillips. 17976.

PREPARATION OF A COMPOUND having vitamin E activity.—K. Merck, W. Merck, L. Merck and F. Merck (Germany, June 25, '38.) 18126.

MANUFACTURE OF POZZOLANIC MATERIAL from the fine ash of carbonaceous fuels.—F. G. Mitchell, and J. E. Temple. 17559.

PRESERVATION OF LATEX.—Monsanto Chemical Co. (United States, June 20, '38.) 17891.

PROCESS FOR SPLITTING UP MIXTURES OF HYDROCARBONS.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. (Netherlands, July 2, '38.) 18101.

PROCESS FOR THE TREATMENT OF WATER.—Naamlooze Vennootschap Octrooien Maatschappij Activit, and P. Smit. 18003.

MANUFACTURE OF LIQUID HYDROCARBONS from gaseous, etc., carbonaceous materials.—E. A. Ocon. 18063.

REGENERATION OF SPENT CATALYSTS in the synthesis of hydrocarbons from carbon monoxide and hydrogen.—H. E. Potts (Naamlooze Vennootschap Koolwaterstoffen Synthese Maatschappij. 17466.

TREATMENT OF CASTOR OIL.—G. V. Stoll. (Schusztek and Szauer). 17778.

PRODUCTION OF POLYMERS OF ISOBUTYLENE.—P. H. Sykes, and Imperial Chemical Industries, Ltd. 17676.

CONTINUOUS SEPARATION OF VEGETABLE AND ANIMAL OILS.—W. W. Triggs (Bernam Oil Palms, Ltd.). 17526.

ZIRCONIUM OXIDES, ETC.—W. W. Triggs (Titanium Alloy Manufacturing Co.). 17824.

PRODUCTION OF PROTECTIVE SALT MIXTURES containing fluorine for the preservation of wood.—K. Wolman, and R. Huber. 17853.

PRODUCTION OF FIBRES OF GLASS, ETC.—Algemeene Kunstvezel Maatschappij N.V. (France, June 25, '38.) 18442.

PRODUCTION OF ARTIFICIAL FILAMENTS from cellulose solutions, etc. E. Blaschke. 18852.

TREATMENT OF RUBBER.—British Rubber Producers' Research Association, and E. H. Farmer. 18524.

FORMATION OF PLASTIC SHEETS.—Carbide and Carbon Chemicals Corporation. (United States, July 9, '38.) 18434.

PREPARATION OF STEROL DEGRADATION PRODUCTS.—Chinoin Gyogyszer Es Vegyeszeti Termekek Gyara R. T. (Hungary, June 28, '38.) 18724; (Hungary, May 30.) 18725.

CHEMICAL DISTRIBUTER.—H. S. Curwen. 18309.

MANUFACTURE OF AQUEOUS SOLUTIONS.—Deutsche Hydrierwerke, A.-G. (Germany, June 23, '38.) 18397.

TREATMENT OF ESTERS containing vinyl groups.—E. I. du Pont de Nemours and Co. (United States, June 25, '38.) 18568.

RECOVERY OF SILVER.—J. G. Fife. (Deutsche-Gold-und Silber-Scheideanstalt vorm. Roessler). (Dec. 21, '38.) 18383.

CEMENTATION OF METALS, ETC.—J. G. Fife (Deutsche-Gold-und Silber-Scheideanstalt vorm. Roessler). 18723.

COLORATION OF FILLERS FOR PLASTICS.—H. J. Fitzpatrick (Naamlooze Vennootschap Verf-en Vernisfabriek Firma W. Paulussen). 18468.

REMOVAL OF OXYGEN from gases.—Gas Light and Coke Co., R. H. Griffith, and P. Lloyd. 18473.

PRODUCTION OF COATED, ETC., TEXTILES, ETC.—B. J. Habgood, M. Jones, W. F. Smith, and Imperial Chemical Industries, Ltd. 18248.

PRODUCTION OF FAST-DYED PATTERN SWELLED EFFECTS upon cellulose-containing textile surfaces.—Heberlein and Co., A.-G. (Germany, July 1, '38.) 18829.

MANUFACTURE OF PRODUCTS having a determined temperature-coefficient of the modulus of elasticity.—Heraeus-Vacuumschmelze, A.-G. (Germany, July 9, '38.) 18268.

REFINING OF BENZINE.—Hydrierwerk Scholven, A.-G. (Germany, June 27, '38.) 18552.

PROCESS FOR SENSITISING SILVER HALIDE EMULSIONS containing colour-formers.—I. G. Farbenindustrie. (Germany, June 23, '38.) 18203; (Germany, June 20.) 18204.

MANUFACTURE OF PORTLAND CEMENT from materials comprising calcium-sulphate.—I. G. Farbenindustrie. (Germany, July 6, '38.) 18207.

MANUFACTURE OF ORTHO-HYDROXY-AZO DYESTUFFS.—I. G. Farbenindustrie. (Germany, July 7, '38.) 18208.

MANUFACTURE, ETC., OF ALCOHOLS of the acetylene series.—G. W. Johnson (I. G. Farbenindustrie.) 18237.

MANUFACTURE OF AZO-DYESTUFFS.—A. H. Knight, and Imperial Chemical Industries, Ltd. 18396.

MANUFACTURE OF VISCOSE ARTIFICIAL FIBRES.—Minerva Soc. Anon. (Italy, July 1, '38.) 18265.

PROCESS FOR REFINING HYDROCARBON OILS, ETC.—E. A. Ocon. 18179.

PROCESS FOR PRODUCING, ETC., BRANCHED CHAIN ALIPHATICS.—E. A. Ocon. 18787.

PRODUCTION OF ASCORBIC ACIDS.—C. Pfizer and Co. (United States, July 15, '38.) (United States, Aug. 31, '38.) 18822; 18823.

MANUFACTURE OF REFRACTORY MAGNESIA.—O. Reynard. 18778.

MANUFACTURE OF COMPOUNDS of the cyclopentano-polyhydrophenanthrene series.—Schering, A.-G. (Germany, July 1, '38.) 18399.

MANUFACTURE OF VALUABLE COMPOUNDS of the pregnane series. Schering, A.-G. (Germany, Dec. 9, '38.) 18759.

MANUFACTURE OF DISPERSING AGENTS.—H. Schou. 18722.

IRON-BERYLLIUM ALLOYS.—Seri Holding Soc. Anon. (Oct. 4, '37.) (Italy, June 30, '37.) 18562.

ALUMINIUM-BERYLLIUM ALLOYS.—Seri Holding Soc. Anon. (Oct. 4, '37.) (Italy, June 30, '37.) 18563.

Complete Specifications Open to Public Inspection

CONDENSATION PRODUCTS, and process of preparing same.—Armour and Co. Dec. 13, 1937. 25487/38.

PROCESS AND PLANT FOR THE FRACTIONATION OF MIXTURES of hydrocarbons or other liquid.—Soc. Pour L'Exploitation Des Procedes Ab-Der-Halden. Dec. 13, 1937. 28442/38.

PROCESS FOR THE MANUFACTURE OF AN IMPROVED SUPERPHOSPHATE FERTILISER.—Chemische Werke Rombach Ges. Dec. 18, 1937. 33087/38.

COMMON HYDROGENATION OF DISTILLATION AND EXTRACTION PRODUCTS OF COALS.—M. Stinnes Gewerkschaft. Dec. 13, 1937. 33908/38.

LUBRICATING OIL.—Texaco Development Corporation. Dec. 18, 1937. 34362/38.

PROCESS FOR PREPARING ALKENE DERIVATIVES.—Naamlooze Vennootschap De Bataafsche Petroleum Maatschappij. Dec. 17, 1937. 35194/38.

CARBIDE SUBSTANCES.—P. M. McKenna. Dec. 13, 1937. 35447/38.

HARD COMPOSITIONS containing metallic carbides.—P. M. McKenna. Dec. 13, 1937. 35448-9/38.

PREPARING CYCLIC HYDROCARBONS from aliphatic hydrocarbons. Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. Dec. 17, 1937. 35561/38.

MANUFACTURE OF ORTHODINITRILES of cyclic ortho-di-carboxylic acids.—Soc. of Chemical Industry in Basle. Dec. 14, 1937. 35669/38.

CHEMICAL MANUFACTURE.—Mathieson Alkali Works. Dec. 18, 1937. 35851/38.

PREPARING ARSENATES by anodic oxidation of salts of arsenious acid.—L. Lowenstein. Dec. 13, 1937. 35873/38.

METHOD OF HYDROGENATING KETONES and aldehydes.—J. Frasch. Dec. 17, 1937. 35947/38.

MANUFACTURE AND PRODUCTION OF MONOCHLORHYDRIN MONONITRATE.—I. G. Farbenindustrie. Dec. 15, 1937. 35989/38.

PREPARING 2-METHYL-5-CHLOR-METHYL-6-AMINO PYRIMIDINE HYDROCHLORIDE.—Merck and Co., Inc. Dec. 14, 1937. 36305/38.

PROCESS FOR THE MANUFACTURE OF DEGRADATION PRODUCTS containing carboxyl groups from compounds of the oestrane series.—Schering, A.-G. Dec. 18, 1937. 36481/38.

MANUFACTURE OF RUBY GLASS.—E. I. du Pont de Nemours and Co. Dec. 15, 1937. 36593/38.

THERMOPLASTIC COMPOSITIONS.—Lettron-Werk Herberts Kommandit-Ges. Dec. 17, 1937. 36667/38.

MANUFACTURE OF RUBBER-LIKE POLYMERISATES.—I. G. Farbenindustrie. Dec. 16, 1937. 36678/38.

PRODUCTION OF DERIVATIVES OF UREA.—E. I. du Pont de Nemours and Co. Dec. 17, 1937. 36719/38.

PROCESS FOR THE MANUFACTURE OF SYNTHETIC LIQUID or gaseous products, obtainable from gaseous constituents.—G. M. Wedard. Dec. 18, 1937. 36588/38.

PRODUCTION OF SYNTHETIC RESINS of the urea-formaldehyde type.—E. I. du Pont de Nemours and Co. Dec. 17, 1937. 36720/38.

PRODUCTION OF ETHERS OF METHYLOL UREA.—E. I. du Pont de Nemours and Co. Dec. 17, 1937. 36721/38.

METHODS OF CARRYING OUT ORGANIC CHEMICAL REACTIONS.—Deutsche Hydrierwerke, A.-G. Dec. 18, 1937. 36842/38.

STABILISATION OF RUBBER HYDROHALIDES.—Imperial Chemical Industries, Ltd. Dec. 17, 1937. 36925/38.

MANUFACTURE OF SURFACE-ACTIVE COMPOUNDS.—E. I. du Pont de Nemours and Co. Dec. 18, 1937. 36927/38.

PRODUCTION OF DRYING OIL.—Naamlooze Vennootschap Industrieele Maatschappij Voorheen Noury and Van Der Lande. Dec. 18, 1937. 36963/38.

Weekly Prices of British Chemical Products

THERE have been no outstanding features in the chemical market during the past week and new bookings have been on a moderate scale. Trade, however, is not less active than is usual for the period. A fair export inquiry has been maintained and ex-contract deliveries have been satisfactory. Values on the whole remain steady and there are no important price changes to record. In the coal tar section business continues to be very restricted and there appears to be little prospect of any improvement until the international political situation becomes clearer. Market quotations are nominal as reported last week.

Price Changes

Rises: Sodium Chromate; Sodium Nitrate; Antimony Sulphide; golden and crimson; Cadmium Sulphide.

Falls: Cresylic Acid, Pale, 99/100% (Manchester).

MANCHESTER.—Holiday influences continue to affect the demand for heavy chemical products on the Manchester market, a number of consuming establishments in Lancashire being closed down this week for the annual holidays. Apart from this factor, however, trading conditions in chemicals are reasonably satisfactory. Delivery specifications against contracts are flowing fairly freely and in the aggregate good quantities are being taken up. New bookings during the past week have been on a moderate scale. With regard to the by-products, the heavy sections are mostly disappointingly slow, but traders continue to experience a steady inquiry for the light distillates.

GLASGOW.—There has been a good demand for general chemicals for home trade during the week though export business is rather quiet. Prices generally remained very steady at about last week's figures with a very firm undertone.

General Chemicals

ACETONE.—£39 to £43 per ton, according to quantity.

ACETIC ACID.—Tech., 80%, £30 5s. per ton; pure 80%, £32 5s.; tech., 40%, £15 12s. 6d. to £18 12s. 6d.; tech., 60%, £23 10s. to £25 10s. MANCHESTER: 80%, commercial, £30 5s.; tech., glacial, £42 to £46.

ALUM.—Loose lump, £8 7s. 6d. per ton d/d; GLASGOW: Ground, £10 7s. 6d. per ton; lump, £9 17s. 6d.

ALUMINIUM SULPHATE.—£7 5s. 0d. per ton d/d Lancs.

AMMONIA, ANHYDROUS.—Spot, 1s. to 1s. 1d. per lb. d/d in cylinders.

AMMONIUM CARBONATE.—£20 per ton d/d in 5 cwt. casks.

AMMONIUM CHLORIDE (see Salammoniac).—Firsts, lump, spot, £42 17s. 6d. per ton; d/d address in barrels. Dog-tooth crystals, £35 per ton; fine white crystals, £18 per ton, in casks, ex store. GLASGOW: Large crystals, in casks, £37 10s.

AMMONIUM DICHROMATE.—8½d. per lb. d/d U.K.

ANTIMONY OXIDE.—£68 per ton.

ARSENIC.—Continental material £10 10s. per ton c.i.f., U.K. ports; Cornish White, £12 5s. to £12 10s. per ton f.o.r., mines, according to quantity. MANCHESTER: White powdered Cornish, £15 10s. per ton, ex store.

BARIUM CHLORIDE.—£11 10s. to £12 10s. per ton in casks ex store. GLASGOW: £12 per ton.

BLEACHING POWDER.—Spot, 35/37%, £9 5s. per ton in casks, special terms for contract. GLASGOW: £9 5s. per ton net ex store.

BORAX COMMERCIAL.—Granulated, £16 per ton; crystal, £17; powdered, £17 10s.; extra finely powdered, £18 10s., packed in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots. GLASGOW: Granulated, £16 per ton in 1-cwt. bags carriage paid.

BORIC ACID.—Commercial granulated, £28 10s. per ton; crystal, £29 10s.; powdered, £30 10s.; extra finely powdered, £32 10s. in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots. GLASGOW: Crystals, £29 10s.; powdered, £30 10s. 1-cwt. bags in 1-ton lots.

CALCIUM BISULPHITE.—£6 10s. per ton f.o.r. London.

CALCIUM CHLORIDE.—GLASGOW: 70/75% solid, £5 12s. 6d. per ton ex store.

CHARCOAL, LUMP.—£6 to £6 10s. per ton, ex wharf. Granulated, £7 to £9 per ton according to grade and locality.

CHLORINE, LIQUID.—£18 15s. per ton, seller's tank wagons, carriage paid to buyer's sidings; £19 5s. per ton, d/d in 16/17 cwt. drums (3-drum lots); £19 10s. per ton d/d in 10-cwt. drums (4-drum lots); 4⅛d. per lb. d/d station in single 70-lb. cylinders.

CHROMETAN.—Crystals, 2⅝d. per lb.; liquor, £13 per ton d/d station in drums.

CHROMIC ACID.—9d. per lb., less 2½%; d/d U.K.

CHROMIC OXIDE.—11½d. per lb.; d/d U.K.

CITRIC ACID.—1s. 0½d. per lb. MANCHESTER: 1s. 0½d. GLASGOW: B.P. crystals, 1s. 0½d. per lb; less 5%, ex store.

COPPER SULPHATE.—£18 5s. per ton, less 2% in bags. MANCHESTER: £18 12s. 6d. per ton f.o.b. GLASGOW: £19 10s. per ton, less 5%, Liverpool in casks.

CREAM OF TARTAR.—100%, £4 12s. per cwt., less 2½%. GLASGOW: 99%, £4 12s. per cwt. in 5-cwt. casks.

FORMALDEHYDE.—£20-£22 per ton.

FORMIC ACID.—85%, in carboys, ton lots, £42 to £47 per ton.

GLYCERINE.—Chemically pure, double distilled, 1,260 s.g., in tins, £3 10s. to £4 10s. per cwt. according to quantity; in drums, £3 2s. 6d. to £3 16s. 0d. Refined pale straw industrial, 5s. per cwt. less than chemically pure.

HYDROCHLORIC ACID.—Spot, 5s. 6d. to 8s. carboy d/d according to purity, strength and locality.

IODINE.—Resublimed B.P., 6s. 9d. per lb. in 7 lb. lots.

LACTIC ACID.—(Not less than ton lots). Dark tech., 50% by vol., £24 10s. per ton; 50% by weight, £28 10s.; 80% by weight, £50; pale tech., 50% by vol., £28; 50% by weight, £33; 80% by weight, £55; edible, 50%, by vol., £41. One ton lots ex works, barrels free.

LEAD ACETATE.—LONDON: White, £31 10s. ton lots; brown, £35. MANCHESTER: White, £31; brown, £30. GLASGOW: White crystals, £29 10s.; brown, £1 per ton less.

LEAD NITRATE.—£27 per ton for 1-ton lots.

LEAD, RED.—£30 15s. 0d. 10 cwt. to 1 ton, less 2½% carriage paid. GLASGOW: £30 per ton, less 2½% carriage paid for 2-ton lots.

LITHARGE.—GLASGOW: Ground, £30 per ton, less 2½%, carriage paid for 2-ton lots.

MAGNESITE.—Calcined, in bags, ex works, about £8 per ton.

MAGNESIUM CHLORIDE.—Solid (ex wharf) £5 10s. per ton. GLASGOW: £7 5s. per ton.

MAGNESIUM SULPHATE.—Commercial, £5 10s. per ton, ex wharf.

MERCURY PRODUCTS.—Ammoniated B.P. (white precip.), lump, 6s. 5d. per lb.; powder B.P., 6s. 7d.; bichloride B.P. (corros. sub.), 5s. 8d.; powder B.P., 5s. 4d.; chloride B.P. (calomel), 6s. 5d.; red oxide cryst. (red precip.), 7s. 6d.; levig, 6s. 9d.; yellow oxide B.P. 6s. 10d.; persulphate white B.P.C., 6s. 7d.; sulphide black (hyd. sulph. cum. sulph. 50%), 6s. 6d. For quantities under 112 lb., 1d. extra; under 28 lb., 5d. extra.

METHYLATED SPIRIT.—61 O.P. industrial, 1s. 5d. to 2s. per gal.; pyridinised industrial, 1s. 7d. to 2s. 2d.; mineralised, 2s. 6d. to 3s. Spirit 64 O.P. is 1d. more in all cases and the range of prices is according to quantities.

NITRIC ACID.—Spot, £25 to £30 per ton according to strength, quantity and destination.

OXALIC ACID.—£48 15s. to £57 10s. per ton, according to packages and position. MANCHESTER: £49 to £55 per ton ex store. GLASGOW: £2 9s. per cwt. in casks.

PARAFFIN WAX.—GLASGOW: 3¾d. per lb.

POTASH, CAUSTIC.—Solid, £33 5s. to £38 per ton according to quantity, ex store; broken, £40 per ton. MANCHESTER: £38.

POTASSIUM CHLORATE.—£36 7s. 6d. per ton. MANCHESTER: £37 per ton. GLASGOW: 4½d. per lb.

POTASSIUM DICHROMATE.—5½d. per lb. carriage paid. GLASGOW: 5½d. per lb., net, carriage paid.

POTASSIUM CHROMATE.—7d. per lb., d/d U.K.

POTASSIUM IODIDE.—B.P. 6s. 3d. per lb. in 7 lb. lots.

POTASSIUM NITRATE.—Small granular crystals, £24 to £27 per ton ex store, according to quantity.

POTASSIUM PERMANGANATE.—LONDON: 9½d to 10½d. per lb. MANCHESTER: B.P. 9½d. to 11½d. GLASGOW: B.P. Crystals, 10½d.

POTASSIUM PRUSSIATE.—5½d. to 6d. per lb. MANCHESTER: Yellow, 6d. to 6½d.

PRUSSIATE OF POTASH CRYSTALS.—In casks, 6¾d. per lb. net, ex store.

SALT CAKE.—Unground, spot, £3 8s. 6d. per ton.

SODA ASH.—Light 98/100%, £5 17s. 6d. per ton f.o.r. in bags.

SODA, CAUSTIC.—Solid, 76/77° spot, £13 10s. per ton d/d station.

SODA CRYSTALS.—Spot, £5 to £5 5s. per ton d/d station or ex depot in 2-cwt. bags.

SODIUM ACETATE.—£19-£20 per ton carriage paid North. GLASGOW: £18 10s. per ton net ex store.

SODIUM BICARBONATE.—Refined spot, £10 10s. per ton d/d station in bags in 1-ton lots. MANCHESTER: £10 15s. GLASGOW: £13 5s. per ton in 1 cwt. kegs, £11 5s. per ton in 2-cwt. bags.

SODIUM BISULPHITE POWDER.—60/62%, £12 10s. to £14 per ton d/d in 2-ton lots for home trade.

SODIUM CARBONATE MONOHYDRATE.—£20 per ton d/d in minimum ton lots in 2 cwt. free bags.
SODIUM CHLORATE.—£27 10s. to £32 per ton. GLASGOW: £1 11s. per cwt., minimum 3 cwt. lots.
SODIUM DICHROMATE.—Crystals cake and powder 4¼d. per lb. net d/d U.K. with rebates for contracts. GLASGOW: 4¼d. per lb., carriage paid.
SODIUM CHROMATE.—4½d. per lb. d/d U.K.
SODIUM HYPOSULPHITE.—Pea crystals, £15 5s. per ton for 2-ton lots; commercial, £11 5s. per ton. MANCHESTER: Commercial, £11; photographic, £15 10s.
SODIUM METASILICATE.—£14 0s. per ton, d/d U.K. in cwt. bags.
SODIUM NITRATE.—Refined, £8 5s. per ton for 6-ton lots d/d. GLASGOW: £1 12s. per cwt. in 1-cwt. kegs, net, ex store.
SODIUM NITRITE.—£18 5s. per ton for ton lots.
SODIUM PERBORATE.—10%, £4 per cwt. d/d in 1-cwt. drums.
SODIUM PHOSPHATE.—Di-sodium, £12 per ton delivered for ton lots. Tri-sodium, £16 10s. per ton delivered per ton lots.
SODIUM PRUSSIATE.—4d. per lb. for ton lots. MANCHESTER: 4¼d. to 5d. GLASGOW: 4d.
SODIUM SILICATE.—£8 2s. 6d. per ton.
SODIUM SULPHATE (GLAUBER SALTS).—£3 per ton d/d.
SODIUM SULPHATE (SALT CAKE).—Unground spot, £3 to £3 10s. per ton d/d station in bulk. MANCHESTER: £3 10s.
SODIUM SULPHIDE.—Solid 60/62%, Spot, £11 15s. per ton d/d in drums; crystals, 30/32%, £9 per ton d/d in casks. MANCHESTER: Concentrated solid, 60/62%, £11; commercial, £8 10s.
SODIUM SULPHITE.—Pea crystals, spot, £14 10s. per ton d/d station in kegs.
SULPHUR PRECIP.—B.P., £55 to £60 per ton according to quantity. Commercial, £50 to £55.
SULPHURIC ACID.—168° Tw., £4 11s. to £5 1s. per ton; 140° Tw., arsenic-free, £3 to £3 10s.; 140° Tw., arsenious, £2 10s.
TARTARIC ACID.— 1s. 1½d. per lb. less 5%, carriage paid for lots of 5 cwt. and upwards. MANCHESTER: 1s. 1¼d. per lb. GLASGOW: 1s. 1½d. per lb., 5%, ex store.
ZINC SULPHATE.—Tech., £11 10s. f.o.r., in 2-cwt. bags.

Rubber Chemicals

ANTIMONY SULPHIDE.—Golden, 7½d. to 1s. 2½d. per lb., according to quality. Crimson, 1s. 6½d. to 1s. 8d. per lb.
ARSENIC SULPHIDE.—Yellow, 1s. 5d. to 1s. 7d. per lb.
BARYTES.—£6 to £6 10s. per ton, according to quality.
CADMIUM SULPHIDE.—3s. 1d. to 3s. 4d. per lb.
CARBON BLACK.—3⅜d. to 4 1/16d. per lb., ex store.
CARBON DISULPHIDE.—£31 to £33 per ton, according to quantity, drums extra.
CARBON TETRACHLORIDE.—£41 to £46 per ton, according to quantity, drums extra.
CHROMIUM OXIDE.—Green, 11½d. per lb.
DIPHENYLGUANIDINE.—2s. 2d. per lb.
INDIA-RUBBER SUBSTITUTES.—White, 4¼d. to 5d. per lb.; dark 3⅜d. to 4⅜d. per lb.
LAMP BLACK.—£24 to £26 per ton del., according to quantity. Vegetable black, £35 per ton upwards.
LEAD HYPOSULPHITE.—9d. per lb.
LITHOPONE.—Spot, 30%, £16 10s. per ton, 2-ton lots d/d in bags.
SULPHUR.—£9 to £9 5s. per ton. SULPHUR PRECIP. B.P., £55 to £60 per ton. SULPHUR PRECIP. COMM., £50 to £55 per ton.
SULPHUR CHLORIDE.—5d. to 7d. per lb., according to quantity.
VERMILION.—Pale, or deep, 5s. per lb., 1-cwt. lots.
ZINC SULPHIDE.—£58 to £60 per ton in casks ex store, smaller quantities up to 1s. per lb.

Nitrogen Fertilisers

AMMONIUM SULPHATE.—The following prices have been announced for neutral quality basis 20.6% nitrogen, in 6-ton lots delivered farmer's nearest station up to June 30, 1939; November, £7 8s.; December, £7 9s. 6d.; January, 1939; £7 11s.; February, £7 12s. 6d.; March/June, £7 14s.
CALCIUM CYANAMIDE.—The following prices are for delivery in 5-ton lots, carriage paid to any railway station in Great Britain up to June 30, 1939; November, £7 12s. 6d.; December, £7 13s. 9d.; January, 1939, £7 15s.; February, £7 16s. 3d;. March, £7 17s. 6d.; April/June, £7 18s. 9d.
NITRO CHALK.—£7 10s. 6d. per ton up to June 30, 1939.
SODIUM NITRATE.—£8 per ton for delivery up to June 30, 1939.
CONCENTRATED COMPLETE FERTILISERS.—£11 4s. to £11 13s. per ton in 6-ton lots to farmer's nearest station.
AMMONIUM PHOSPHATE FERTILISERS.—£10 19s. 6d. to £14 16s. 6d. per ton in 6-ton lots to farmer's nearest station.

Coal Tar Products

BENZOL.—At works, crude, 9½d. to 10d. per gal.; standard motor, 1s. 3½d. to 1s. 4d.; 90%, 1s. 4½d. to 1s. 5d., pure 1s. 8½d. to 1s. 9d. MANCHESTER: Crude, 1s 0½d. per gal.; pure, 1s. 8d. to 1s. 8½d. per gal.
CARBOLIC ACID.—Crystals, 6¾d. to 7¼d. per lb., small quantities would be dearer; Crude, 60's 1s. 7d. to 1s. 10d.; dehydrated, 2s. 6d. per gal., according to specification; Pale, 99/100%, per lb. f.o.b. in drums; crude, 2s. 1d. per gal.
CREOSOTE.—Home trade, 3¾d. to 4d. per gal., f.o.r., makers' works; exports 6d. to 6¼d. per gal., according to grade. MANCHESTER: 3½d. to 4½d.
CRESYLIC ACID.—97/99%, 1s. 5d. to 1s. 8d.; 99/100%, 2s. to 2s. 6d. per gal., according to specification. MANCHESTER: Pale, 99/100%, 1s. 5d.
NAPHTHA.—Solvent, 90/160, 1s. 6d. to 1s. 7d. per gal.; solvent, 95/160%, 1s. 7d. to 1s. 8d., naked at works; heavy 90/190%, 1s. 1¼d. to 1s. 3d. per gal., naked at works, according to quantity. MANCHESTER: 90/160%, 1s. 5d. to 1s. 7½d. per gal.
NAPHTHALENE.—Crude, whizzed or hot pressed, £4 10s. to £5 10s. per ton; purified crystals, £9 10s. per ton in 2-cwt. bags. LONDON: Fire lighter quality, £3 to £4 10s. per ton. MANCHESTER: Refined, £10 10s. to £11 10s. 0d. per ton f.o.b.
PITCH.—Medium, soft, 26s. per ton, f.o.b. MANCHESTER: 24s. f.o.b., East Coast.
PYRIDINE.—90/140%, 12s. 6d. to 14s. per gal.; 90/160%, 10s. 6d. to 11s. 6d. per gal.; 90/180%, 3s. to 4s. per gal. f.o.b. MANCHESTER: 10s. 6d. to 14s. per gallon.
TOLUOL.—90%, 2s. 1d. to 2s. 2d. per gal.; pure 2s. 5d. to 2s. 6d. MANCHESTER: Pure, 2s. 5d. per gallon, naked.
XYLOL.—Commercial, 2s. 3d. per gal.; pure, 2s. 5d. MANCHESTER: 2s. 4d. per gallon.

Wood Distillation Products

CALCIUM ACETATE.—Brown, £6 15s. to £9 5s. per ton; grey, £8 to £8 5s. MANCHESTER: Brown, £8; grey, £9 10s.
METHYL ACETONE.—40.50%, £32 to £35 per ton.
WOOD CREOSOTE.—Unrefined, 6d. to 8d. per gal., according to boiling range.
WOOD NAPHTHA, MISCIBLE.— 2s. 8d. to 3s per gal;. solvent, 3s. to 3s. 5d. per gal.
WOOD TAR.—£3 to £8 per ton, according to quality.

Intermediates and Dyes

ANILINE OIL.—Spot, 8d. per lb., drums extra, d/d buyer's works.
ANILINE SALTS.—Spot, 8d. per lb. d/d buyer's works, casks free.
BENZIDINE, HCl.—2s. 7½d. per lb., 100% as base, in casks.
BENZOIC ACID, 1914 B.P. (ex toluol).— 1s. 11½d. per lb. d/d buyer's works.
m-CRESOL 98/100%.—1s. 8d. to 1s. 9d. per lb. in ton lots.
o-CRESOL 30/31° C.—6½d. to 7½d. per lb. in 1-ton lots.
p-CRESOL 34/35° C.— 1s. 7d. to 1s. 8d. per lb. in ton lots.
DICHLORANILINE.—2s. 1½d. to 2s. 5½d. per lb.
DIMETHYLANILINE.—Spot, 1s. 7½d. per lb., package extra.
DINITROBENZENE.—7½d. per lb.
DINITROCHLORBENZENE, SOLID.—£79 5s. per ton.
DINITROTOLUENE.—48/50° C., 8½d. per lb.; 66/68° C., 11d.
DIPHENYLAMINE.—Spot, 2s. 2d. per lb.; d/d buyer's works.
GAMMA ACID, Spot, 4s. 4½d. per lb. 100%, d/d buyer's works.
H ACID.—Spot, 2s. 7d. per lb.; 100%, d/d buyer's works.
NAPHTHIONIC ACID.—1s. 10d. per lb.
β-NAPHTHOL.—£97 per ton; flake, £94 8s. per ton.
α-NAPHTHYLAMINE.—Lumps, 1s. 1d. per lb.
β-NAPHTHYLAMINE.—Spot, 3s. per lb.; d/d buyer's works.
NEVILLE AND WINTHER'S ACID.—Spot, 3s. 3½d. per lb. 100%.
o-NITRANILINE.—4s. 3½d. per lb.
m-NITRANILINE.—Spot, 2s. 10d. per lb. d/d buyer's works.
p-NITRANILINE.—Spot, 1s. 10d. to 1s. 11d. per lb. d/d buyer's works.
NITROBENZENE.—Spot, 4½d. to 5d. per lb., in 90-gal. drums, drums extra, 1-ton lots d/d buyer's works.
NITRONAPHTHALENE.—9½d. per lb.; P.G., 1s. 0½d. per lb.
SODIUM NAPHTHIONATE.—Spot, 1s. 11d. per lb.; 100% d/d buyer's works.
SULPHANILIC ACID.—Spot, 8¾d. per lb. 100%, d/d buyer's works.
o-TOLUIDINE.—10½d. per lb., in 8/10 cwt. drums, drums extra.
p-TOLUIDINE.—1s. 10½d. per lb., in casks.
m-XYLIDINE ACETATE.—4s. 3d. per lb., 100%.

Latest Oil Prices

LONDON, July 12.—LINSEED OIL was steady. Spot, £26 5s. per ton (small quantities); July, £23 15s.; Aug., £23 12s. 6d.; Sept.-Dec., £23 10s.; Jan.-April, £23 7s. 6d., naked. SOYA BEAN OIL was quiet. Oriental, July-Aug. shipment, c.i.f., bulk, £18 per ton. RAPE OIL was slow. Crude extracted, £31 10s. per ton; technical refined, £32 15s., naked, ex wharf. COTTON OIL was quiet. Egyptian crude, £17 15s. per ton; refined common edible, £21 15s.; deodorised, £23 15s., naked, ex mill (small lots £1 10s. extra). TURPENTINE was steady. American, spot, 33s. per cwt.; Aug. delivery, 32s. 6d.

HULL.—LINSEED, spot, £24 15s. per ton; July, £24 5s.; Aug., £23 15s.; Sept.-Dec., £23 10s. COTTON OIL.—Egyptian, crude, spot, £17 per ton; edible refined, £20; technical refined, spot, £20; deodorised, £22, naked. GROUNDNUT OIL.—Extracted, spot, £23 per ton; deodorised, £26. RAPE OIL.—Extracted, spot, £30 10s. per ton; refined, £31 10s. SOYA OIL.—Extracted, spot, £25 10s. per ton; deodorised, £28 10s. COD OIL.—F.o.r. or f.a.s., 25s. per cwt. in barrels. CASTOR OIL.—Pharmaceutical, 39s. 6d. per cwt.; first, 34s. 6d.; second, 32s. 6d. TURPENTINE.—American, spot, 34s. 3d. per cwt.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

J. F. WILLIAMS (1939), LTD., Brighton, paint manufacturers. (M., 15/7/39.) June 21, £250 debenture to R. D. Comber, Brighton; general charge.

R. G. HARBOTT AND CO., LTD., London, E., manufacturing chemists. (M., 15/7/39.) June 29, debenture to A. R. Cox, Smallburgh, securing £700 and further advances not ex. therewith £1,000, and £1,000 debenture; general charges.

Company Winding-up Voluntarily

BRITISH INCORRODIBLE METAL CO., LTD. (C.W.U.V., 15/7/39.) June 30. R. G. Leach, 11 Ironmonger Lane, E.C., liquidator.

DOUGHTY - RICHARDSON FERTILISERS, LTD. (C.W.U.V., 15/7/39.) July 1 (members), it being expedient to effect an amalgamation of this company, with Goole Tillage Co., Ltd., and with Doughty Goole Fertilisers, Ltd. G. D. Pearsons, liquidator.

Declaration of Solvency Filed

BRYMBO SILICA QUARRIES, LTD. (D.S.F., 15/7/39.) July 6.

E. BADER AND CO., LTD. (D.S.F., 15/7/39.) London, W.C., celluloid manufacturers. June 30.

Company News

Courtaulds, Ltd., are recommending the payment of an interim dividend of 2 per cent. less tax, for 1939, on the £24,000,000 ordinary stock to be made on August 15. A year ago an interim of 1½ per cent. was distributed.

Midland Bank, Ltd., have announced an interim dividend for the half-year ended June 30 last at the rate of 8 per cent. actual, less income tax, payable on July 15 next. The same rate of dividend was declared a year ago.

British Celanese, Ltd., have announced the payment on July 31 to holders registered July 14, of a half-year's dividend on the 7 per cent. first cumulative preference shares, bringing the dividends paid on this class of share up to April 30, 1938.

Savory and Moore, Ltd., report trading profits for the year of £41,019 (£57,275). To depreciation, £5,031 (£5,033); to repairs and renewals, £3,116 (£3,240); to debenture interest, £14,294 (£14,044); to debenture sinking fund, £4,204 (£4,008); to tax and N.D.C., £700 (£1,800); final dividends recommended on preference; to general reserve, £3,000 (£4,491); forward, £10,328 (£17,835).

Beecham Maclean Holdings, Ltd., which was formed in July, 1938, to acquire from Beechams Pills, Ltd., over 90 per cent. of the ordinary capital of Macleans, Ltd., announces a final ordinary dividend of 3¼ per cent., making 16¼ per cent., less tax. Net revenue of the company amounted to £275,470.

A. Boake Roberts and Co., Ltd., report a trading profit for the year to March 31 of £53,634 (£61,838), after depreciation. To directors' remuneration £5,110 (£5,433), commissions and employees' profit-sharing £5,630 (£8,017), tax £9,203 (£14,999), N.D.C. £1,925 (£2,275), staff pensions £1,106 (£1,282), debenture redemption nil (£1,379). Final on ordinary 2 per cent., making 9 per cent., tax free (same), to general reserve £10,000 (nil), forward £94,098 (£96,438).

Low Temperature Carbonisation, Ltd., are not paying a dividend for the year ended March 31 last. For the preceding year 4 per cent., less tax, was paid. Total income has fallen from £116,683 to £42,944. Depreciation takes £1,896 more at £11,504, and £14,117, against £22,873 is deducted for tax. Net profits, after providing for debenture interest, etc., amount to £814, compared with £67,737. This amount goes forward, making with £32,450 brought in, a total of £33,265.

Books Received

The War Gases (Chemistry and Analysis). By Dr. Mario Sartori. Pp. 360. London: J. and A. Churchill, Ltd. 21s.

New Companies Registered

Dalo Ltd. 353,930.—Private company. Capital £5,000 in 20,000 shares of 5s. each. To carry on business as manufacturers of and dealers in (both wholesale and retail) paints and emulsions of all kinds, varnish, enamel, polish, lacquer, shellac, cellulose, etc. Subscribers: Frederic W. Webb, 32 Etheldene Avenue, Muswell Hill, N.10; Lionel G. Bradford. Registered offices: 16 and 17 Little Britain, E.C.1.

Stellar Filtration and Equipment Company, Ltd. 353,449.—Private company. Capital £2,000 in 4,000 shares of 10s. each. To carry on the business of manufacturers of and dealers in filters, filter beds, filtering materials and plant; engineers, manufacturing chemists, etc. Subscribers: Richd. Nicklin, 81 Erlanger Road, S.E.14; Frank Blewchamp. Registered office: Imperial Buildings, Kingsway, W.C.2.

Phenoglaze, Ltd. 353,676.—Private company. Capital £100 in 75 "A" ordinary and 25 "B" ordinary shares of £1 each. To carry on the business of manufacturers of and dealers in glazes, lacquers, dyes, stains, paints, colours, enamels, distempers, etc. Subscribers: Hans Joachim Carsten, 16 Maldon Road, Wallington, Surrey; Cyril O. Futcher. Registered office: 16 Maldon Road, Wallington, Surrey.

South Wales Metal Smelting and Refinery Works, Ltd. 353,324.—Private company. Capital £15,000 in 15,000 shares of £1 each. To carry on the business of metal extraction and refining and the manufacture of metal products, metal alloys, metal amalgams and other allied products, by chemical and other processes, etc. Subscribers: Jack Brodie, Sentinel House, Southampton Row, W.C.1; Naima Landman. Registered office: 11 Queen Victoria Street, E.C.4.

Unimetal Industries, Ltd. 353,330.—Private company. Capital £5,000 in 5,000 shares of £1 each. To carry on the business of manufacturers of and dealers in all kinds of ferrous and non-ferrous metals, waste products, residues, ores, oxides, sulphides, sulphates, precious metals, lead pipes and sheets, etc. Subscribers: David Morgan, "Croindene," Rook Lane, Chaldon, Caterham, Surrey; Jean Rabin. Registered office: 22 Basinghall Street, E.C.2.

Jubilee Oils, Ltd. 353,580.—Private company. Capital £500 in 500 shares of £1 each. To carry on the business of producers, refiners and distributors of oils, petroleum and petroleum products, manufacturers and distributors of paints, varnishes, chemicals, engineering requisites, electrical, photographic and scientific apparatus, etc. Directors: Edward F. S. Halliday, "Maycroft," Bridgnorth Road, Wombourne, Staffs.; James Weaver. Registered office: 31 Wolverhampton Street, Dudley.

E. Earnshaw and Company, Ltd. 353,239.—Private company. Capital £1,000 in £1,000 ordinary shares of £1 each. To carry on the business of manufacturers of and wholesale and retail dealers in chemicals, gas and disinfectants of every description; dyes, paints, cellulose and synthetic enamels, pigments, acids, powders, medicines, lime, manures and fertilisers, etc. Subscribers: Ernest Earnshaw, 33 Jackoyd Lane, Newsome, Huddersfield; Irene Earnshaw. Registered office: Station Road, Bradley, Huddersfield.

Harrington Bone and Chemical Company, Ltd. 353,444.—Private company. Capital £5,000 in 5,000 ordinary shares of £1 each. To acquire the business of tallow refiners and melters carried on by Harrington Bone and Chemical Company at Harrington Mill, Macclesfield, Cheshire, and to carry on the business of manufacturers of and dealers in chemicals, disinfectants, dyes, pigments, manures, fertilisers, oils, greases, soaps, etc. Directors: John L. Cumptsey, senr., "The Yews," Titherington, Macclesfield; John L. Cumptsey, junr. Registered office: Harrington Mill, Macclesfield, Cheshire.

Chemical Trade Inquiries

The following trade inquiries are abstracted from the "Board of Trade Journal." Names and addresses may be obtained from the Department of Overseas Trade (Development and Intelligence), 35 Old Queen Street, London, S.W.1 (quote reference number).

Chile.—The Commercial Secretary to H.M. Embassy at Santiago reports that the Chilean State Railways Administration is calling for tenders for the supply and delivery of quantities of various chemicals, laboratory equipment and disinfectants. Tenders will be received at the Departamento de Materiales y Almacenes Ferrocarriles del Estado, Santiago, Chile, up to 4 p.m. on August 17, 1939. Offers must be accompanied by samples. (Ref. T. 24355/39.)

Egypt.—A firm in Cairo wishes to obtain the representation, on a commission basis, of United Kingdom manufacturers of pharmaceutical products. (Ref. No. 550.)

Poland.—An agent in Krakow wishes to obtain representation, on a commission basis, of United Kingdom manufacturers of chemicals and chemical plant. (Ref. No. 546.)